RESPIRONICS®

BiPAP® Focus™ Ventilator

SERVICE MANUAL

REF 1029568 Rev A

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Chapter 1. Introduction and Intended Use

The BiPAP Focus Non-invasive Ventilator is a microprocessor-controlled, electrically powered mechanical ventilator. The BiPAP® Focus™ Ventilator System provides noninvasive ventilation for adult (over 30 kg or 66 lbs.) patients for the treatment of respiratory insufficiency and distress, and obstructive sleep apnea. The BiPAP Focus is appropriate for acute, sub-acute, and intra-hospital transport settings.

The BiPAP Focus System is intended for use with nasal and full face masks. The BiPAP Focus is not intended to be a life-support device.

The BiPAP Focus Ventilator meets or exceeds all applicable safety requirements, consensus guidelines, US regulatory statutes, and international regulatory standards for life support/mechanical ventilation devices.

Read this manual thoroughly prior to performing service or maintenance on the BiPAP Focus Ventilator. This manual contains advanced troubleshooting, calibration, and maintenance instructions for the BiPAP Focus. All maintenance and repair work should be performed by qualified biomedical technicians who have received appropriate training and authorization to provide maintenance, repair, and service for the BiPAP Focus.

Review the operating instructions for the BiPAP Focus Ventilator before running tests, checking operational readiness, or initiating patient use. These instructions include important information about ventilator safety and operation.

For additional information about accessories or related equipment, such as humidifiers and remote alarm systems, refer to the appropriate instruction manual prior to operating with the BiPAP Focus Ventilator.

The *BiPAP Focus Operator's Manual* for the BiPAP Focus Ventilator lists all applicable warnings and cautions. Review these notices thoroughly before operating the ventilator.

Recommended Tools and Test Equipment

Table 1-1 lists the recommended tools, test equipment, and materials required to service and maintain the BiPAP Focus Ventilator.

Description	Manufacturer and Model
Test Equipment	
Digital multimeter (DMM) accurate to three decimal places	Local Supplier
Electrical safety analyzer	Dale LT 5440 or equivalent
Pneumatic calibration analyzer capable of measuring low pressure (cmH_2O), flow rate (LPM), and volume (liters)	Respironics P/N 1012598 or equivalent
Ventilator Accessories	
Connector, plastic, 22mm OD	Respironics P/N 1006242 or equivalent
Connector, 22-mm (quantity 2)	Respironics P/N or equivalent
Flow Control Valve	Respironics P/N 1006120
Pressure test adapter	Respironics P/N 312710
Tee, plastic with silicone rubber coupling	Respironics P/N C06260 or equivalent
Tee silicone (quantity 2)	Respironics P/N 1006243 or equivalent
Hand Tools and Materials	
Pliers	Local supplier
#1 Phillips head screwdriver	Local supplier
#2 flat head screwdriver	Local supplier
#2 Phillips head screwdriver	Local supplier
Cleaning Cloth	Local supplier
Isopropyl Alcohol	Local supplier
Metric hex key set (rounded ends), 1.5 to 4 mm	Local supplier
Mild detergent or antiseptic wipes	Local supplier
Needle nose pliers	Local supplier
BiPAP Focus Communications Cable Kit (USB & DB9)	Respironics P/N 1030010
PC or laptop (required for downloading software)	Required: Windows XP operating systems, serial comm port, and USB port
Pen size flat head screwdriver	Local supplier
Pen size Phillips head screwdriver	Local supplier
Test lung, hard sided	Respironics P/N 1021671 or local supplier
Torque driver capable of 1 to 25 in.-lbs (N-m)	Local supplier

Table 1-1: Recommended Test Equipment, Tools, and Materials

Where to Go for Help

For Customer Service and Product Support contact:

Respironics, Inc.
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Chapter 2. Warnings and Cautions

Warnings, Cautions, and Notes are used throughout this manual to identify possible safety hazards, conditions that may result in equipment or property damage, and important information that must be considered when performing service and testing procedures on the BiPAP Focus.

WARNING:	**A condition that could cause injury to a patient, operator or technician if the operating instructions in this manual are not followed correctly.**
CAUTION:	A condition that could cause damage to, or shorten the service life of, the device.
NOTE:	Important information concerning the construction or operation of the device.

Warnings

- To assure the safety of the service technician and the specified performance of the device, Respironics recommends that only technicians having prior training or experience servicing ventilatory devices perform any repairs or adjustment to the BiPAP Focus.
- Use only Respironics repair/service parts. Use of non-Respironics parts may alter ventilator reliability resulting in damage. Use of non-Respironics repair parts will affect the ventilator warranty. Contact Customer Service at 1-800-345-6443 or 724-387-4000 for more information.
- High voltages are present in the AC/DC Power Supply, Power Cord and VGA PCB. To avoid electrical shock, disconnect the power cord before attempting any repairs on the device or cleaning.
- DO NOT immerse this device into any fluids or allow any liquid to enter the cabinet or the filter intake.
- To avoid personal injury, always disconnect external AC and DC power sources from the ventilator before servicing or cleaning.
- To avoid personal injury or the possibility of damage to the ventilator, regularly inspect the power cord to ensure it is free from defects and any obvious wear and is properly grounded.
- This device is not for life support.

- Never troubleshoot while a patient is connected to the ventilator, since normal operation is suspended.
- If the ventilator has been operating, the internal parts may be hot. Use caution when accessing.
- To prevent disease transmission, use protective equipment when handling contaminated bacteria filters or other patient accessories. Follow manufacturers' labeling and institutional guidelines for disposal of contaminated accessories.
- To avoid cross-contamination between the test equipment and ventilator, always install a bacteria filter between the main outlet and test device.
- Explosion hazard. Do not operate the ventilator in the presence of flammable anesthetic agents.
- To avoid the risk of fire, use only Respironics-approved batteries. All battery connections are keyed to ensure proper connection. Do not attempt to connect a battery incorrectly. Only qualified technicians should install the battery.
- Use only Respironics-supplied cables with the nurse call station/ serial communications connector.
- To avoid personal injury or the possibility of damage to the ventilator, DO NOT operate this device if it has failed any of its diagnostic tests, either self or service initiated.

Cautions

- Federal law (US) restricts this device to sale by, or on the order of, a physician.
- Failure to replace a dirty filter may cause the device to operate at higher than normal temperatures and damage the device.
- Use only Respironics-approved filters.
- Use only Respironics-approved batteries.
- The gray reusable air inlet filter must be completely dry before use. Never place a wet filter into the device.
- Do not place more than one gray reusable air inlet filters that come with the ventilator into the device at the same time. One gray reusable air inlet filter and one white disposable ultra-fine filter may be used.
- Replace any filter that is damaged.
- Do not attempt to clean or reuse disposable air inlet filters.
- Electronic components used in this device are subject to damage from static electricity. Repairs made to this device must be performed only in an antistatic, Electro-static Discharge (ESD)-protected environment.

- Care should be taken to avoid exposure of the BiPAP Focus to temperatures at or near the extremes of those specified in Chapter 3. If exposure to such temperatures has occurred, the device should be allowed to return to room temperature before being turned on.
- Never place liquids on or near the BiPAP Focus.
- The information in this manual is provided for service personnel reference.
- Always ensure that you are following proper electrostatic discharge (ESD) grounding procedures before handling static-sensitive devices.
- Be careful not to pull or crimp any cables, tubes or wires.
- Troubleshooting and repair should be performed only by a qualified service technician.

Notes

- Refer to the BiPAP Focus Operator's Manual for product use, additional Warnings, Cautions and Notes.

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Chapter 3. Theory of Operation

The BiPAP® Focus™ Ventilator System provides noninvasive breathing support for adult patients weighing 30 kg (66 lbs.) or greater.

The BiPAP Focus System offers two ventilation modes:

- Continuous positive airway pressure (CPAP), which provides a single level of positive pressure to the patient.
- Spontaneous/Timed (S/T), which provides two levels of positive pressure (one during inspiration and one during exhalation), and delivers timed breaths if the patient does not initiate a breath.

The BiPAP Focus System alarms annunciate when high or low pressure regulation, apnea, patient disconnect, low power, or loss of mains power conditions occur. The system displays a real-time estimated delivered pressure bar graph.

An Apnea Rate (#Apnea) Alarm is provided to alert the caregiver to repeated periods of short apneas of 10 seconds or more. The caregiver can set the value for how many apnea periods (10 seconds or more) can occur within an hour before alarming. The total number of Apnea periods (10 seconds or more) for the previous hour is displayed as part of the patient data. Because the previous hours data is displayed, the number of apnea periods for the first hour is an estimate only.

The BiPAP Focus System includes alarm silence and alarm pre-silence features. Battery backup provides a minimum of 45 minutes of backup power at default settings in case AC power is not available (for example, during transport within the hospital).

The BiPAP Focus System features Digital Auto-Trak™, which allows it to recognize and compensate for unintentional leaks and promote synchrony by adjusting its trigger and cycle algorithms to maintain optimum performance.

Air Delivery System Components	
Air Inlet Filter(s) 	The air inlet filter removes coarse particulate from ambient air as it is entrained into the blower assembly. See Section 4 for periodic maintenance information. The BiPAP Focus has a reusable dust filter that is gray in color. An optional pollen filter, white in color is also available.
Blower 	The blower draws room air though the air inlet filter and muffler, and outputs air for delivery to the patient. The DC impeller-type blower recirculates air through the flow valve when not delivering gas to the patient. Compressor speed is determined by patient settings. The controller PCB controls compressor speed.

Table 3-1: Air Delivery System Components

Air Delivery System Components (Continued)	
Flow valve (FV) 	The flow valve (valve assembly) is a mechanical sliding assembly driven by an electromagnetic coil. Valve commands from the PCB control current (-125mA to 675mA) to the coil. Movement of the flow valve is proportional to the current through the coil. The flow valve operates as a closed-loop system, using feedback from the flow sensor and pressure transducers.
Air Flow Sensor 	The air flow sensor measures flow from the flow valve. The ventilator uses this measurement to provide closed loop control of the flow valve and to compute the flow and volume delivered to the patient.

Table 3-1: Air Delivery System Components

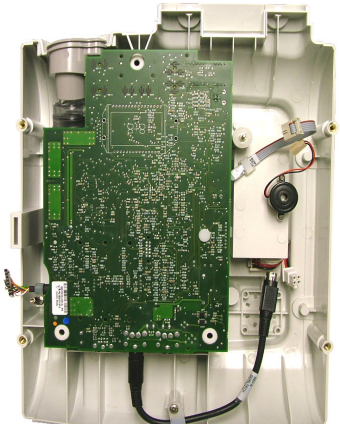
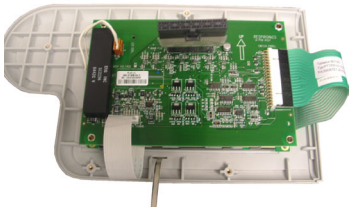
Electronic System Components	
User Interface PCB 	• Motorola 68332 microcontroller • Inter-processor communication with controller PCB • VGA Display, Keyboard and front panel LED Interface • Primary alarm driver • Remote alarm relay • USB and RS-232 serial communication • Internal Battery charging and monitoring • Temperature monitor • Microcontroller watchdog and reset logic • Voltage monitoring
Controller PCB 	• Blower On / Off / Closed-Loop Speed Control • Air Flow Valve Controller • Pressure Measurement • RS-232 Communication • Inter-processor communication with interface PCB • Backup alarm driver
VGA PCB 	• STN Blue Mode Transmissive Viewing • One-Quarter VGA (320 x 240) • Dot Pitch 0.36mm x 0.36mm

Table 3-2: Electronic System Components

Electronic System Components (Continued)	
External AC/DC Power Supply 	• 90-240 VAC, 40-60Hz Input • 120 Watt 18 Volt DC Output
Internal NiMH (Nickel Metal Hydride) Battery 	• 8 cell 3.8 Amp Hour provides 9.6 Volt output nominal • In-line thermal fuse • Built-in thermistor for temperature monitoring • Nominal charge time under 5 hours • Nominal run time 45 minutes

Table 3-2: Electronic System Components

Back Panel

The back panel has three connection points and the On/Off switch.

- Nurse call station / serial communications port
- USB port
- AC/DC Power supply input & power cord relief clip
- ON/OFF switch

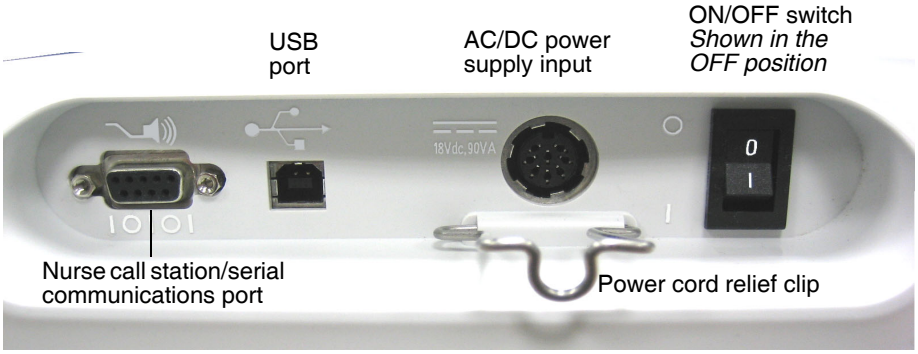


Figure 3-1: Back Panel

Specifications

Default Settings

S/T mode	RR = 4/min
IPAP = 12 cmH_2O	I-Time = 1 sec
EPAP = 4 cmH_2O	Ramp Time = 0 min
Rise-Time = 2	Ramp Start = 4 cmH_2O

Settings: CPAP Mode

CPAP *Continuous Positive Airway Pressure*	Range: 4-20 cmH_2O (4-20 hPa) Resolution: 1 cmH_2O (1 hPa) Dynamic accuracy: ±5 cmH_2O (5 hPa)
Ramp Time *Period over which the ventilator increases inspiratory pressure from Ramp Start setting to CPAP setting.*	Range: 0-45 min. Resolution: 5 min. Accuracy: ±10% of setting

Ramp Start *Initial inspiratory pressure*	Range: 4 cmH_2O to CPAP setting (4 hPa to CPAP setting) Resolution: 1 cmH_2O (1 hPa)

Settings: S/T Mode

IPAP *Inspiratory positive airway pressure, the inspiration pressure setting*	Range: 4-30 cmH_2O (4-30 hPa) Resolution: 1 cmH_2O (1 hPa) Dynamic accuracy: ±5 cmH_2O (5 hPa) IPAP cannot be set below EPAP.
EPAP *Expiratory positive airway pressure, the exhalation pressure setting*	Range: 4-25 cmH_2O (4-25 hPa) Resolution: 1 cmH_2O (1 hPa) Dynamic accuracy: ±5 cmH_2O (5 hPa)
Rise-Time *How quickly the ventilator increases inspiratory pressure from EPAP pressure to 67% of pressure support level*	Range: 1-6 (where 1 = 0.1 sec and 6 = 0.6 sec) Resolution: 1 Accuracy: ± (0.15 + 10% of setting) sec
Rate *Respiratory rate, used to determine if a timed breath is delivered*	Range: 1-30/min Resolution: 1/min Accuracy: ±1/min or ±10% of setting, whichever is greater over a 4-minute period. I-Time and Rate settings cannot allow I-Time to exceed expiratory time.
I-Time *Inspiratory time*	Range: 0.5-3 sec Resolution: 0.1 sec Accuracy: ± (0.1 + 10% of setting) sec I-Time and Rate settings cannot allow I-Time to exceed expiratory time.
Ramp Time	Range: 0-45 min Resolution: 5 min Accuracy: ±10% of setting
Ramp Start *Initial inspiratory pressure*	Range: 4 cmH_2O to EPAP (4 hPa to EPAP) Resolution: 1 cmH_2O (1 hPa)

Measured Data

Patient circuit pressure bar graph (continuous display)	Range: 0-35 cmH_2O (0-35 hPa) Resolution: 1 cmH_2O (1hPa) Accuracy: ±10% of scale In the event of total loss of power, the inspiratory and expiratory pressure measured at the patient exhalation port at 60 L/min is less than 1 cmH_2O by virtue of mask and ventilator design.
Rate *Measured respiratory rate*	Range: 0-60/min Resolution: 1/min Accuracy: ± (1 + 10% reading)
Est. Vt *Estimated delivered tidal volume*	Range: 0-4000 mL Resolution: 1 mL Accuracy (S/T Mode): ± (50 mL + 10% reading) (when leak <60 L/min, using the Vision circuit) Accuracy (CPAP Mode): ± (100 mL + 10% reading) (when leak <60 L/min, using the Vision circuit) Vt display flashes when peak inspiratory flow for successive breaths varies by more than 15 L/min.
Est. MV *Estimated exhaled minute volume*	Range: 0-99 L/min Resolution: 0.1 L/min Accuracy: ± 1 L or ± 10% actual, whichever is greater (when leak is <60 L/min using the Vision circuit).
Leak *Estimated Patient leak*	Range: 0-150 L/min Resolution: 1 L/min Accuracy: ± (15 L/min +10%)
#Apnea *Brief apnea periods*	Range: 0-99/hour Resolution: 1/hour Accuracy: ± 1/hour (after 1 hour)
Trigger *Breath trigger*	Range: Patient or Timed (ventilator)

NOTE: Est. Vt and Est. MV estimates are at ambient temperature and pressure, dry (ATPD). Pressure signals are filtered using a 50-Hz low pass Butterworth filter.

Alarm Settings

Apnea *The length of time without a spontaneous breath that triggers the Apnea alarm*	Range: 20, 40, 60 sec or OFF Default setting: 20 sec
#Apnea *The number of periods (10-seconds or more) in the previous hour where the patient has not initiated a spontaneous breath.* *NOTE: For the first hour, this value is an estimate only.*	Range: 5, 10, 20, or OFF Default setting: OFF

Options

Display Units *Unit of pressure: centimeters of water (cmH_2O), hectoPascals (hPa), or millibars (mbar).*	Range: cmH_2O, hPa, or mbar
Alarm Volume *Audible alarm volume*	Range: OFF, or minimum volume, to maximum volume, in 5 discrete settings.
Contrast *Screen contrast*	Range: 20% to 100%
Brightness *Screen brightness*	Range: 10% to 100%
Reverse Video *Toggles reverse video*	Range: ON or OFF
Screen Lock Timer	Range: ON or OFF

Nurse Call Station/Serial Communications Connector Pinout

Pin	Signal
Nurse Call Station	
1	Nurse call station common
6	Normally open (NO) during normal (non-alarm) operation
9	Normally closed (NC) during normal (non-alarm) operation
Serial Communications	
2	Respironics advanced serial protocol (RASP) RS-232 Transmit (Tx)
3	RASP RS-232 Receive (Rx)
4	Not used
5	RS-232 signal ground
7	RS-232 Tx (reserved for future use)
8	RS-232 Rx (reserved for future use)

NOTE:

- When pins 1 and 6 are used, the relay is open during normal operation, and closed during an alarm condition including loss of power.
- When pins 1 and 9 are used, the relay is closed during normal operation, and open during an alarm condition including loss of power.
- Female DB9 connector pin configuration:

WARNING: Use only Respironics-supplied cables with the nurse call station/serial communications connector.

Physical

BiPAP Focus System Dimensions	355-mm H x 290-mm W x 140-mm D (14.0-in. H x 11.4-in. W x 5.5-in. D) Excluding accessories, gas inlets, patient connections.
Weight	4.5 kg (10 lbs.)

Power

Input range	90-264 V~, 47-63 Hz, 90 VA
Battery backup	3.8 amp-hour (Ah) nickel metal hydride (NiMH) battery provides 45 minutes of operation at default settings. System automatically activates the battery charge cycle when connected to AC power and the ON/OFF switch is ON (|) (during normal operation or Standby mode). Recharge time is typically under 5 hours, but may extend further depending on machine settings if operating on battery prior to recharge, or if operating in elevated ambient temperature (above 28°C). Charge is complete when the green CHARGING LED extinguishes.
Nurse call station relay	Rated current: 0.280 A Rated voltage: 250V
Fuse type	No replaceable fuses.
Power cord	Refer to the“Complete Parts List” on page 9-1

Triggers and Cycles

Volume-based trigger
Flow reversal cycle
Shape signal
Timed trigger
IPAP maximum of 3.0 seconds
Peak flow cycle

Supplemental Oxygen

Flow and pressure into oxygen valve	Maximum flow: 15 L/min at ambient pressure

Environmental

Temperature	Operating: +5 to +35°C at 10 to 95% relative humidity Storage: -20 to 60°C at 95% relative humidity
Atmospheric pressure	Operating: 83 to 102 kPa (830 to 1020 mBar)

Storage	When the BiPAP Focus is not in use for periods of 2 weeks or longer, it is recommended that the unit be stored in a clean, sanitized plastic bag.

Bacteria Filter

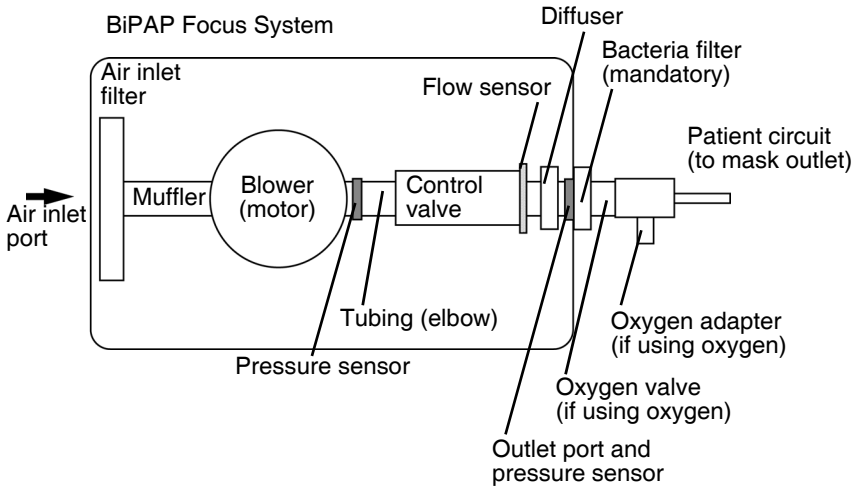
Dead space	68 mL
Bacteria/viral filter efficiency	>99.99% P/N 342077
Resistance	0.7 $cmH_2O/L/s$ at 0.5 L/s
Connectors	Male connector 15-mm I.D./22-mm O.D. Female connector 22-mm I.D.

Date of Manufacture

The 12-digit serial number located on the base of the unit indicates the date of manufacture. From left to right, the fifth and sixth digits indicate the year; the seventh and eighth, the month; the ninth and tenth, the day. For example, the serial number *0001050903-20* indicates that the device was manufactured 3 September, 2005.

Pneumatics

BiPAP Focus System pneumatic diagram:



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Chapter 4. Periodic Maintenance

This chapter provides guidelines and illustrates the cleaning and maintenance procedures for the BiPAP Focus system.

Table summarizes maintenance procedures for the BiPAP Focus System.

To ensure correct operation, perform all maintenance at the recommended intervals.

BiPAP Focus System Maintenance

Part	Interval	Procedure
Battery	Replace the battery if a **Batt. Charge Failure** alarm occurs, or as indicated in See "Replacing the Battery" on page 4-3.	Qualified service technician only. *NOTE: If the unit has been in storage or has not been used for 3 months, the battery will require a full charge.*
Air inlet filter(s)	Reusable: clean monthly or as needed.	Follow the "Cleaning the Reusable Air Inlet Filter" on page 4-2.
	Reusable: every year or as needed.	Replace.
	Disposable: replace as needed.	Do not attempt to clean or reuse disposable filters.
	The air path cannot be cleaned.	
System exterior	As needed.	Clean the exterior of the ventilator with a soft damp cloth moistened with any of the following solutions: • Mild detergent or soapy water • 10% bleach solution (90% water) • Isopropyl alcohol (91%) • Quaternary ammonium germicides (sprays or disposable cloths) Do not spray or immerse in liquid. Do not allow liquid to penetrate the system.
Flow Valve Assembly	10,000 hours (Total operating hours Refer to Figure 5-3 on page 5-3.)	Replace Flow Valve Assembly

Table 4-1: BiPAP Focus System Maintenance

Storing the BiPAP Focus

When the BiPAP Focus is not in use for periods of 2 weeks or longer, it is recommended that the unit be stored in a clean, sanitized plastic bag.

While the unit is being stored, ensure that the power switch on the back of the unit is in the **OFF (O)** position. If the switch is not turned **OFF**, the internal battery will be depleted within two weeks. If the unit is stored with the power switch in the **OFF (O)** position, the internal battery will deplete within 3 months.

Cleaning the Reusable Air Inlet Filter

Follow these steps to clean the reusable air inlet filter (Figure 1):

1. Remove the filter via the main rear access door (filter door) and examine for damage or debris on the filter.

2. Wash using one of the following solutions, then rinse thoroughly:
   - Liquid dishwashing detergent
   - White distilled vinegar (5% acidicy)
   - Isopropyl alcohol (99.9%)
   - Hydrogen peroxide (3%)
   - Bleach
   - Sodium hypochloride (6%)

3. Allow the filter to dry completely before reinstalling.

Figure 1: Reusable Air Filter

CAUTION: Failure to replace a dirty filter may cause the device to operate at higher than normal temperatures and damage the device.

CAUTION: Use only Respironics-approved filters.

CAUTION: The gray reusable air inlet filter must be completely dry before use. Never place a wet filter into the device.

Replacing the Air Inlet Filter(s)

The reusable air inlet filter (gray) must be installed and replaced every year. An additional ultra-fine disposable filter (white) is also recommended for enhanced particulate filtering.

CAUTION: Replace any filter that is damaged.

CAUTION: Do not attempt to clean or reuse disposable air inlet filters.

CAUTION: Do not place more than one gray reusable air inlet filters that come with the ventilator into the device at the same time. One gray reusable air inlet filter and one white disposable ultra-fine filter may be used.

Replacing the Battery

WARNING: To avoid the risk of fire, use only Respironics-approved batteries. All battery connections are keyed to ensure proper connection. Do not attempt to connect a battery incorrectly. Only qualified technicians should install the battery.

NOTE: NOTE: If a Low Battery or Battery Depleted alarm occurs during Pre-Operational Check, then the battery requires charging. If a Batt. Charge Failure alarm occurs, the battery may be fully depleted. A re-charge is recommended before proceeding. If the battery does not begin to charge after one hour and the Batt. Charge Failure persists, contact customer service for a replacement battery.

NOTE: Battery alarms will sound towards the end of the battery test. Gas delivery will continue during this time, until the battery is depleted.

If the number of battery powered operations is greater than 220 per year, the battery should be replaced every six months. If the number of battery powered operations is less than 220 per year, the battery should be replaced every year. It is recommended that the battery be tested once per month. A fully charged battery is designed to operate for 45 minutes at default settings (See “Power” on page 3-11). If the battery does not continue to deliver gas for 45 minutes at these settings, it should be replaced.

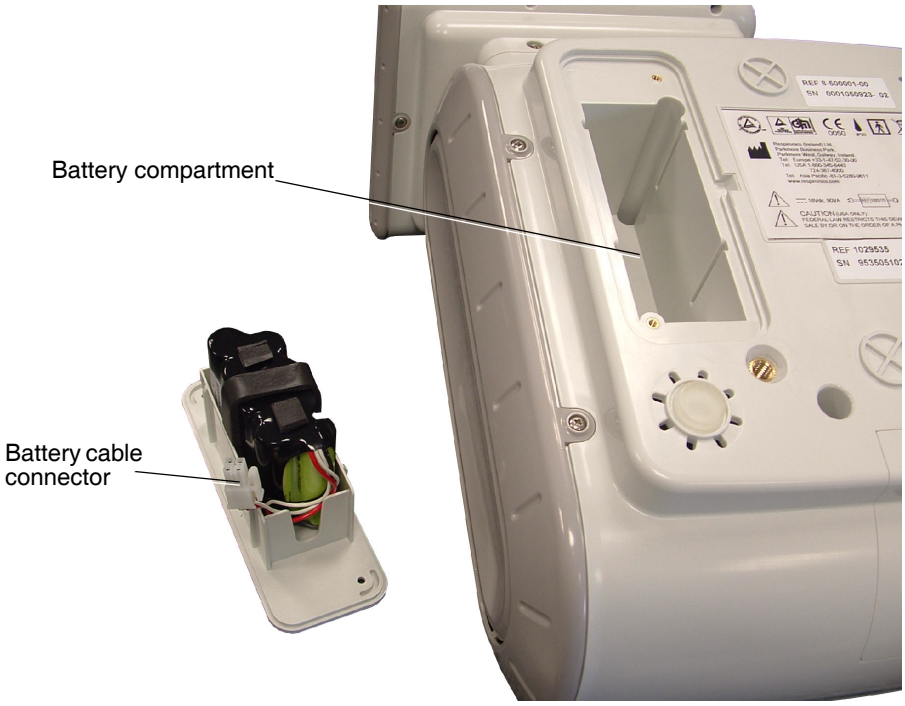

Figure 4-1: Replacing the Battery

Follow these steps:

1. Turn the system **OFF** and disconnect the DC power supply.
2. Remove the two screws that secure the battery compartment door.
3. Unplug the battery cable and remove the old battery from its compartment.
4. Insert a new Respironics-approved battery (see "BiPAP Focus Replacement Parts List" on page 9-1) into the compartment and plug the battery cable into its connector.
5. Replace the battery compartment door and screws.
6. Reconnect the DC power supply.

CAUTION:	Use only Respironics-approved batteries.

Chapter 5. Diagnostic Mode and Troubleshooting

This section describes the BiPAP Focus diagnostic mode and other troubleshooting procedures.
Diagnostic mode allows:

- View product information, including serial numbers and versions of software and hardware.
- View and adjust system settings, including Language, time since last service, date and time.
- View and adjust operator preferences, including units of pressure, alarm volume, contrast, brightness, reverse video and screen lock.
- View the significant event log.
- View the UI board controls and sensor readings for troubleshooting.
- Test alarm indicators and view internal voltages for troubleshooting.
- Test blower and controller board backup alarm.

WARNING:	**Diagnostic mode suspends normal ventilation: disconnect the patient from the ventilator before entering diagnostic mode.**
CAUTION:	Troubleshooting and repair should be performed only by a qualified service technician.

Entering Diagnostic Mode

To enter diagnostic mode, simultaneously press the **Alarm/Reset** and **Alarm/ Silence** keys on the ventilator front panel at power up for 15 seconds or until diagnostic mode appears on the screen. At the warning prompt, press **Enter** to start diagnostic mode. The diagnostic main menu (Figure 5-1) appears.

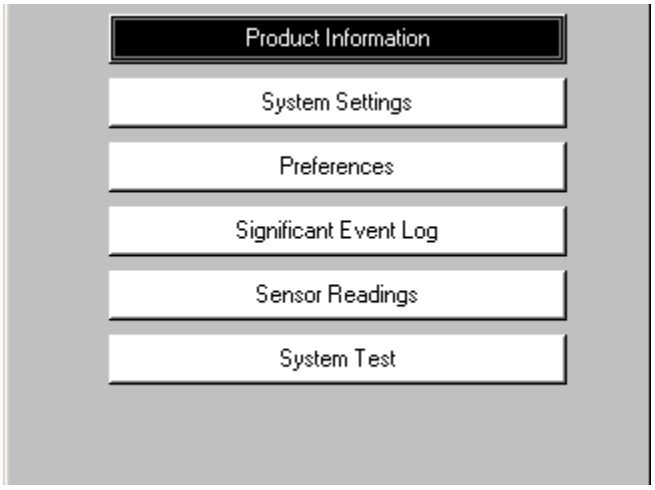

Figure 5-1: Diagnostic Mode Main Menu

Press the arrow keys to highlight the menu selection, then press **Enter**.

To exit diagnostic mode at any time, turn the ventilator off.

Product Information

The product information screen (Figure 5-2) displays serial number and version number information for hardware and software components of the ventilator.

To view the product information screen, use the arrow keys to highlight *PRODUCT INFORMATION* on the diagnostic mode main menu, then press **Enter**. Press **Menu** to return to the main menu.

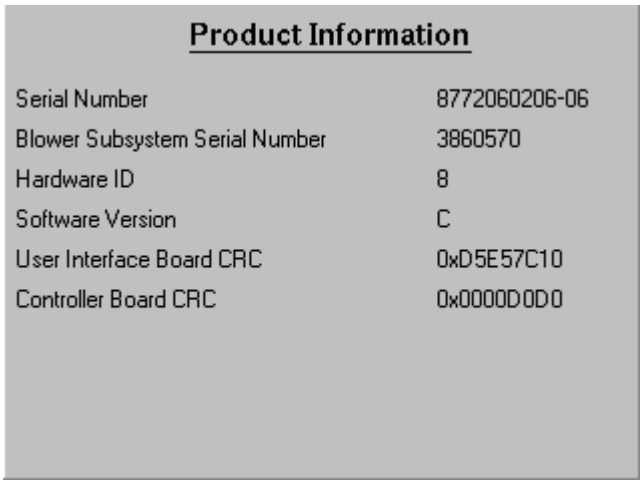

Figure 5-2: Diagnostic Mode: Product Information Screen

System Settings

The systems settings screen (Figure 5-3) allows:

- *Set the date and time:* select the month, day, year, hour, minute, and 12- or 24-hour format.
- *Language, Time Since Service:* choose the Language and reset the time since the last service

1. Use the arrow keys to highlight the field or button whose value to change, then press **Enter**.
2. Use the arrow keys to adjust a value or select a setting from a drop-down menu, then press **Enter** (or press Cancel to exit without making a change).
3. Press the **Menu** key to return to the main menu.

Figure 5-3: Diagnostic Mode: System Settings Screen

Preferences

The preferences screen (Figure 5-13) allows:

- Adjust display units.
- Adjust alarm volume.
- Adjust display contrast.
- Adjust display brightness.
- Select reverse or normal video.
- Adjust screen lock timer.

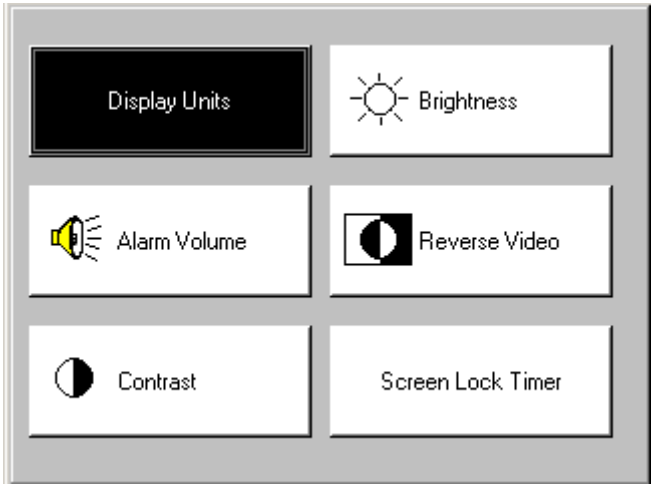

Figure 5-4: Diagnostic Mode: Preferences Screen

To view the preferences screen, use the arrow keys to highlight PREFERENCES on the diagnostic mode main menu, then press **Enter**.

1. Use the arrow keys to highlight the button whose value to change, then press **Enter**:

2. If selected:
   Display Units, the screen shows the current ventilator units settings. Use the arrow keys to highlight cmH_2O, hPa, or mbar then press **Enter**.

   Alarm Volume, a popup screen displays the current alarm volume setting. Use the arrow keys to adjust the volume from 1 to 5 (in increments of 1), then press **Enter** (or press **Cancel** to exit without making a change). The alarm volume cannot be turned completely off.

   Contrast, a popup screen displays the current display contrast setting. Use the arrow keys to adjust the contrast from 20% to 100% (in increments of 20%), then press **Enter** (or press **Cancel** to exit without making a change).

   Brightness, a popup screen displays the current display brightness setting. Use the arrow keys to adjust the contrast from 10% to 100% (in increments of 10%), then press **Enter** (or press **Cancel** to exit without making a change).

   Reverse Video, pressing Enter toggles between reverse and normal video.

   Screen Lock Timer, the screen displays on/off lock setting. Use the arrow keys to select, the press **Enter**.

3. Press the **Menu** key to return to the main menu.

Significant Event Log

The significant event log (Figure 5-5) allows viewing a log of system events, including settings changes, alarms, and codes that can be used for troubleshooting. See “Significant Event Log” on page 5.which describes significant event codes in detail. The log includes the 200 most recent events.

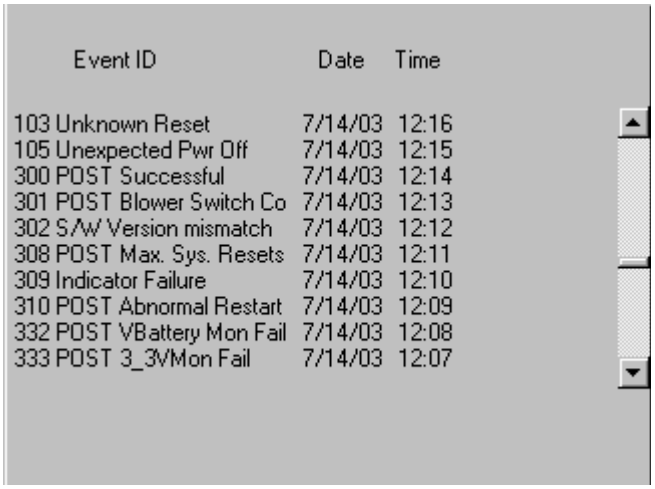
Event ID
Date
Time
103 Unknown Reset 7/14/03 12:16
105 Unexpected Pwr Off 7/14/03 12:15
300 POST Successful 7/14/03 12:14
301 POST Blower Switch Co 7/14/03 12:13
302 S/W Version mismatch 7/14/03 12:12
308 POST Max. Sys. Resets 7/14/03 12:11
309 Indicator Failure 7/14/03 12:10
310 POST Abnormal Restart 7/14/03 12:09
332 POST VBattery Mon Fail 7/14/03 12:08
333 POST 3_3VMon Fail 7/14/03 12:07

Figure 5-5: Diagnostic Mode: Significant Event Log

To view the significant event log, use the arrow keys to highlight *SIGNIFICANT EVENT LOG* on the diagnostic mode main menu, use the arrow keys to scroll up and down. Press **Menu** to return to the main menu.

Setting Up the Serial Interface for DRPT

Follow these steps to connect the ventilator and a PC to create a diagnostic report (DRPT):

1. Connect BiPAP Focus Communications Cable (P/N 1030010) between the PC and BiPAP Focus ventilator. Connect the male end labeled *Diagnostics* to the back of the ventilator and the female end to the service PC.

2. Power up the ventilator in diagnostic mode: simultaneously press the **Alarm/Reset** and **Alarm Silence** keys for approximately 15 seconds while turning ventilator power on.

3. Launch the HyperTerminal program on the PC by clicking **Start > Programs > Accessories > Communications > HyperTerminal**, then double-clicking on the *HyperTerminal* icon.

4. Enter a name for the connection (*BiPAP Focus Communications* is entered in Figure 5-6) and choose an icon, then click **OK**).

Figure 5-6: Entering a Name for the Connection to the BiPAP Focus Ventilator

5. Select the appropriate serial port (Figure 5-7 shows *Com1* selected), then click **OK**.

Figure 5-7: Selecting the Serial Port

6. Enter these settings for the serial port (Figure 5-8):

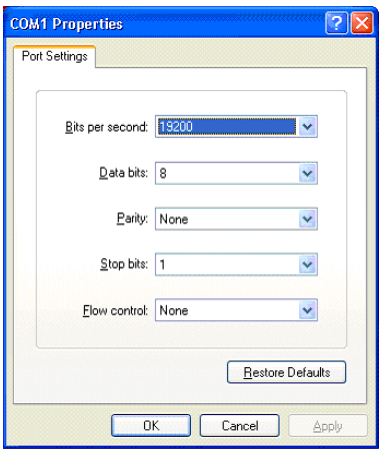

Figure 5-8: Serial Port Settings

7. Click **OK**.

8. The blank HyperTerminal window remains. Continue configuring the properties. Click **File > Properties** from the menu bar.

9. Click on the **Settings** tab (Figure 5-9).

10. Select **ANSIW** from the Emulation drop-down list box.

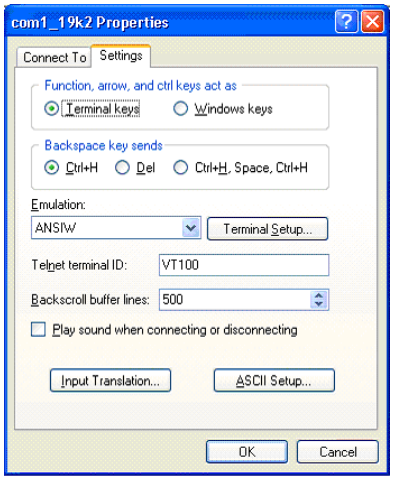

Figure 5-9: HyperTerminal Settings Tab

11. Click the **Terminal Setup** button.

12. Select underline and blink for cursor settings then click **OK**.

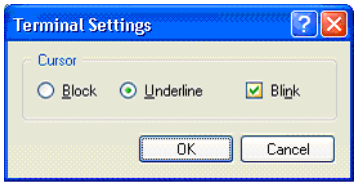

Figure 5-10: Terminal Settings

13. Click the **ASCII Setup** button (Figure 5-9).

14. Match the *ASCII Setup* screen (Figure 5-11), then click **OK**.

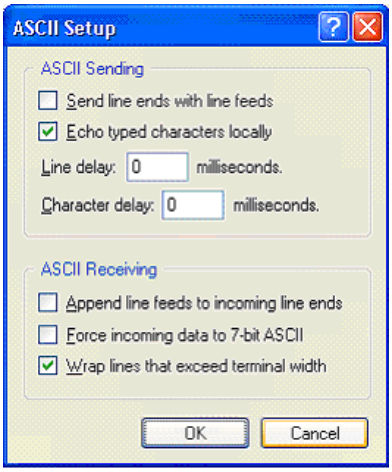

Figure 5-11: ASCII Setup Screen

15. Save this configuration. Select **File > Save As** and save to the desktop if you want to create an icon for BiPAP Focus Communications on the Windows desktop.

Generating a Diagnostic Report (DRPT)

1. With the BiPAP Focus ventilator in diagnostic mode and the serial communcations cable, the end labeled Diagnostics connected to the ventilator, start HyperTerminal, open the BiPAP Focus Communications file, or click on the BiPAP Focus Communications icon on the PC (if created).

2. Type **DRPT** (all caps) in the dialog box, and press the **Enter** key. This pulls information found in the significant event log.

3. If the ventilator is connected and communication occurs, a response similar to the following appears:

Respironics Inc. BiPAP Focus Ventilator
Serial Number: 8772060206-04
Date & Time : 6/19/06 20:49

	Event ID	Date	Time	
905	Pwr On reset	6/19/06	20:43	
300	POST Successful	6/19/06	20:43	
102	Power Off	6/19/06	20:42	
437	Battery Voltage Failed	6/19/06	20:42	V615,615
639	Disconnect	6/19/06	20:42	
635	Battery Depleted	6/19/06	20:42	637,633
644	Apnea	6/19/06	20:42	
639	Disconnect	6/19/06	20:	
635	Battery Depleted	6/19/06	20:41	687,649
643	Low Battery	6/19/06	20:41	714,723
905	Pwr On reset	6/19/06	20:41	
300	POST Successful	6/19/06	20:41	
102	Power Off	6/19/06	20:41	
905	Pwr On reset	6/19/06	20:26	
300	POST Successful	6/19/06	20:26	
102	Power Off	6/14/06	16:52	
905	Pwr On reset	6/13/06	16:32	
300	POST Successful	6/13/06	16:32	
102	Power Off	6/13/06	16:32	
639	Disconnect	6/13/06	16:31	
905	Pwr On reset	6/13/06	16:27	
300	POST Successful	6/13/06	16:27	

Figure 5-12 shows how to interpret each line of the DRPT report.

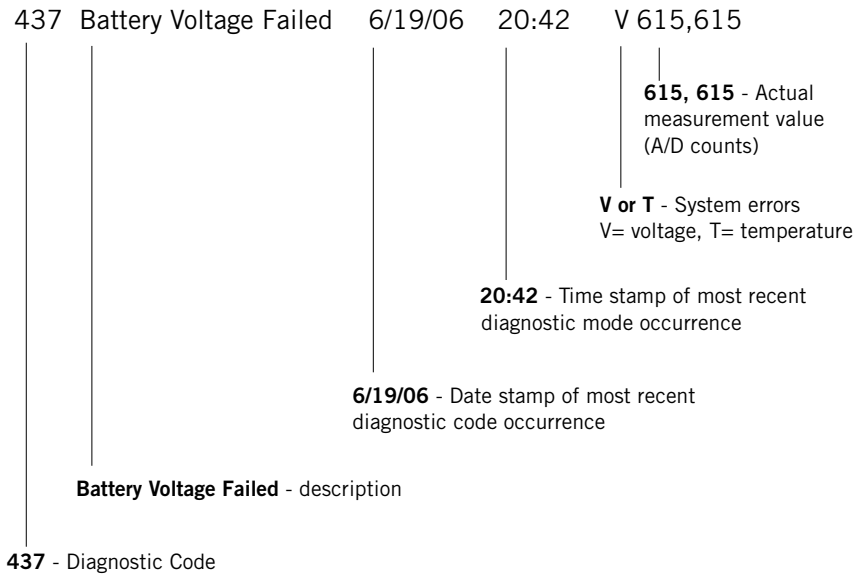
437 Battery Voltage Failed 6/19/06 20:42 V 615,615
615, 615 - Actual measurement value (A/D counts)
V or T - System errors V= voltage, T= temperature
20:42 - Time stamp of most recent diagnostic mode occurrence
6/19/06 - Date stamp of most recent diagnostic code occurrence
Battery Voltage Failed - description
437 - Diagnostic Code

Figure 5-12: Interpreting the DRPT Report

Sensor Readings

The sensor readings screen (Figure 5-13) allows:

View sensor readings: view these readings to see the real-time effect of changes to voltages, temperature and control signals.

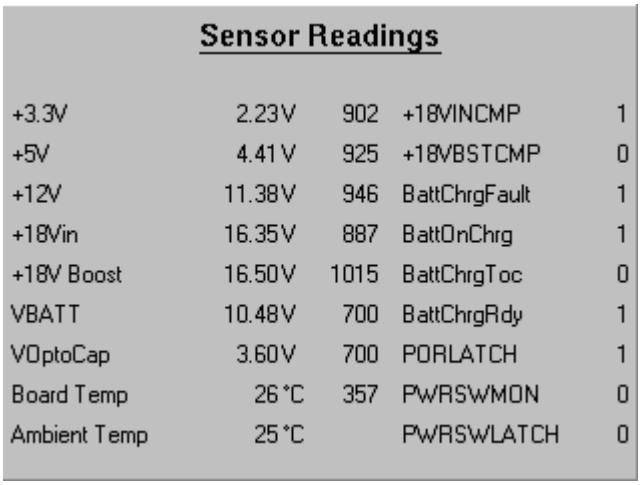
Sensor Readings
+3.3V 2.23V 902 +18VINCMP 1
+5V 4.41V 925 +18VBSTCMP 0
+12V 11.38V 946 BattChrgFault 1
+18Vin 16.35V 887 BattOnChrg 1
+18V Boost 16.50V 1015 BattChrgToc 0
VBATT 10.48V 700 BattChrgRdy 1
VOptoCap 3.60V 700 PORLATCH 1
Board Temp 26°C 357 PWRSWMON 0
Ambient Temp 25°C PWRSWLATCH 0

Figure 5-13: Diagnostic Mode: Sensors Screen

Table 5-1 defines sensor readings for the BiPAP Focus.

NOTE:	Hi = 1 and Lo = 0

Sensor Readings Defined		
Diagnostics Label	**Actual Measured Value**	**Description**
+3.3V	+3.3V_MEAS	Measurement of +3.3V Supply count limits: 883 to 976 Voltage (V) = counts * 0.003662
+5V	+5V_MEAS	Measurement of +5V Supply count limits: 884 to 977 Voltage (V) = counts * 0.005371
+12V	+12V_MEAS	Measurement of +12V supply Count limits: 889 to 983 Voltage(V) = counts * 0.012817

Table 5-1: Sensor Readings Defined (Sheet 1 of 4)

Sensor Readings Defined		
Diagnostics Label	**Actual Measured Value**	**Description**
+18Vin	18VIN_MEAS	Measurement of +18V (mains input) Count limits: 882 to 1008 Voltage(V) = counts * 0.019043
+18V Boost	18V_BOOST_MEAS	Measurement of +18V_Boost supply Count limits: 923 to 1020 Voltage(V) = counts * 0.019043
VBATT/VTEMP	VBATT_VTEMP_MEAS	Battery Temperature measurement when unit operating from Mains or Battery Voltage measurement when operating on battery. Counts limit (volt.): 624 to 936 Voltage(V) = counts * 0.012817 Counts limit (temp.): 79 to 421 Within limits - battery temp ok.
VOptoCap	OPTO_CAP_MEAS	Measurement of backup capacitor voltage on User Interface Board. Count limits: 616 to 782 Voltage(V) = counts * 0.005371
Board Temp	BOARD_TEMP_MEAS	Measurement of temperature on the User Interface PCB Count limits: 233 to 540 Temp. (degC) = ((counts * .00244) - 0.6) * 100
Ambient Temp	TEMP_DATA	Measurement of Ambient Temperature within the unit Limits : 0 to 60degC.
+18VINCMP	VIN_COMP_BUF	Signal for detection if the incoming mains voltage is above a certain threshold (15.64V typically). Hi: Above threshold Lo: Below threshold

Table 5-1: Sensor Readings Defined (Sheet 2 of 4)

Sensor Readings Defined		
Diagnostics Label	**Actual Measured Value**	**Description**
+18VBSTCMP	18V_BOOST_COMP	Signal for detection if the 18V_Boost mains voltage is above a certain threshold (15.64V typically) Hi: Above threshold Lo: Below threshold
BattChrgFault	BATT_CHRG_FAULT_BUF	Signal for detection if there is a fault in the battery charging Hi: Fault Lo: No Fault
BattOnChrg	BATT_ON_CHG_BUF	Signal for detection if the battery is being charged Hi: Battery charging Lo: Battery not charging
BattChrgToc	BATT_CHR_TOC	Signal for detection if a top-off charge is being applied to battery Hi: Battery NOT in TOC state Lo: Battery in TOC state
BattChrgRdy	BATT_CHG_READY_BUF	Signal for detection if the battery is ready for charging Hi: Ready for charging Lo: Not ready for charging
PORLATCH	EXT_WDOG_LATCHED	Signal for detection if the processor was reset due to a drop in the +3.3V rail. This signal must be primed by software, with the EXT_WDOG_LATCH_CLR signal. This can be done using the PORLATCLK diagnostics label in the System Test screen. Hi: Loss of +3.3V supply caused last reset Lo: Last reset not caused by loss of +3.3V supply. Probably caused by watchdog (software reset)

Table 5-1: Sensor Readings Defined (Sheet 3 of 4)

Sensor Readings Defined		
Diagnostics Label	**Actual Measured Value**	**Description**
PWRSWMON	PWR_SW_MON_PROC	User interface Standby Key monitor Hi: Standby key is in-active (released). Lo: Standby key is active (pressed).
PWRSWLATCH	PWR_SW_LATCHED	Latched User interface Standby Key monitor. This signal must be primed by software with the PWR_SW_CLK signal. This can be done using the PWRSWCLK diagnostics label in the System Test screen. Hi: Standby key has NOT been pressed. Lo: Standby key has been pressed.

Table 5-1: Sensor Readings Defined (Sheet 4 of 4)

System Test

The alarm, indicator, and voltage screen (Figure 5-14) allows:

- *Test alarms:* toggle the primary alarm speaker, backup alarm speaker, or remote alarm ON or OFF.
- *Indicators:* toggle the Alarm LED, Silence LED, and the On Battery LED, ON or OFF.
- Miscellaneous Tests: toggle the following settings ON or OFF: Blower, VBattMeasEn, V Out Enable, POWERSWCLK, PWRTUIOFF, PORLATCLK, WDSTROBE.

NOTE:	When the V BattMeasEn signal is asserted is enables the measurement of the Battery Thermistor temperature on the sensor readings screen.

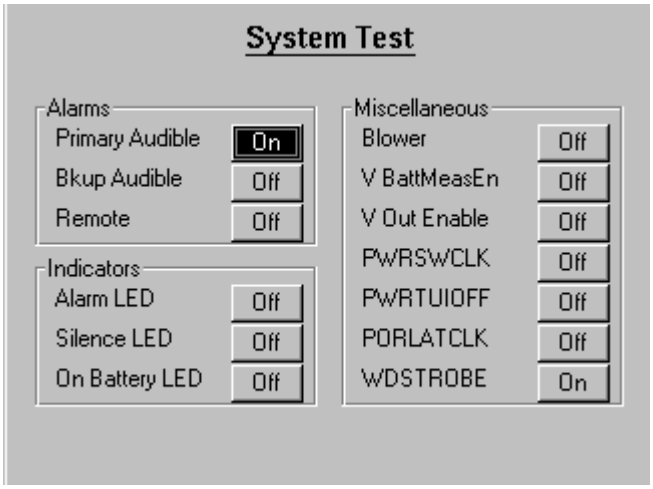

Figure 5-14: Diagnostic Mode: System Test Screen

System Test Defined

Diagnostics Label	Schematic Label	Description
BLOWER	TCB_SWITCH_ON and TCB_SWITCH_OFF	Used to turn blower on/off TCB_SWITCH_ON Hi and TCB_SWITCH_OFF Lo: Blower ON TCB_SWITCH_ON Lo and TCB_SWITCH_OFF Hi: Blower OFF These signals are mutually exclusive in software
V BattMeasEn	VBATT_MEAS_EN	Selects ADC measurement of battery voltage or battery temperature Hi: Battery voltage measured by ADC Lo: Battery temperature measured by ADC

Table 5-2: System Test Defined (Sheet 1 of 2)

System Test Defined		
Diagnostics Label	**Schematic Label**	**Description**
V Out Enable	VOUT_EN	Option to turn on/off the power out to the TCB. Reserved for future use. Therefore, the option to control the power to the UI cannot be changed in software. If used, the following applies: HI: Turns on the 18V_Boost out to the Controller Board. LO: Turns off the 18V_Boost out to the Controller Board.
PWRSWCLK	PWR_SW_CLK	Clocks the Standby Switch latch. Lo to Hi: Clocks a '1' to the latch output. Hi to Lo: No change of state.
PWRTUIOFF	PWR_TUI_OFF	PWR_TUI_OFF: Control line to switch off the power. Hi: Clears the latch which removes the 18V_Boost rail from the system, thereby shutting down power by placing the unit in Standby mode. Lo: No change in state
PORLATCLK	EXT_WDOG_LATCH_CLR	Clocks the Power On Reset latch. This can be used to determine if an external power on reset has occurred due to the +3.3V rail dropping. Lo to Hi: No change of state. Hi to Lo: Clocks a '1' to the latch output.
WDSTROBE	WDSTROBE	WDSTROBE: External watchdog strobe. Software is required to apply a high pulse of 50ns minimum duration at a maximum of every 1.2seconds to avoid the watchdog resetting the processor.

Table 5-2: System Test Defined (Sheet 2 of 2)

Significant Event Codes

The BiPAP Focus Ventilator generates a log of system events, including settings changes, alarms, and codes that can be used for troubleshooting. If a ventilator inoperative condition or unexpected reset occurs, the significant event log includes the ventilator settings, patient data, and alarm conditions that were in effect.

The significant event log can include at least 200 of the most recent events, with the most recent events listed first. The ventilator maintains the significant event log regardless of whether there is power to the ventilator.

The significant event log includes the following information:

1. *Event ID:* This includes a code and brief text description of the event.

2. *Date:* Each event is date-stamped in a month/day/year format (for example, 10/20/02).

3. *Time:* Each event is time-stamped in hour/minute/second format (for example, 09:15:23).

4. *Old value:* For settings changes, the previously selected value is displayed.

5. *New value:* For settings changes, the most recently selected value is displayed.

Use the arrow keys to scroll through the log.

NOTE: Table 5-3 lists event IDs, and recommends corrective actions if appropriate. When performing corrective actions:

- Perform the corrective actions in the order listed (if applicable) until the problem is resolved.
- Before replacing a part, slave in a replacement part to verify that it corrects the problem. If so, verify that the problem recurs with the original part installed, then replace the part and confirm that the problem is corrected.

Significant Event Log: Event IDs		
Code	**Short text for code**	**Comment / Corrective Action**
1	ERR SOFTWARE	Controller processor detected a software error. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
2	ERR PROGRAM CRC FAILURE	Controller processor detected a program memory checksum error. If this persists replace the controller PCB.
3	ERR EXTERNAL RAM FAILURE	Controller processor detected an external RAM memory error. If this persists replace the controller PCB.
4	ERR FIQ STACK OVERFLOW	Controller processor detected a stack overflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 1 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
5	ERR FIQ STACK UNDERFLOW	Controller processor detected a stack underflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
6	ERR NEST STACK OVERFLOW	Controller processor detected a stack overflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
7	ERR NEST STACK UNDERFLOW	Controller processor detected a stack underflow.
8	ERR IRQ STACK OVERFLOW	Controller processor detected a stack overflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
9	ERR IRQ STACK UNDERFLOW	Controller processor detected a stack underflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
10	ERR TMR STACK OVERFLOW	Controller processor detected a stack overflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
11	ERR TMR STACK UNDERFLOW	Controller processor detected a stack underflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
12	ERR SVC STACK OVERFLOW,	Controller processor detected a stack overflow.
13	ERR SVC STACK UNDERFLOW	Controller processor detected a stack underflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
14	ERR THREAD STACK OVERFLOW	Controller processor detected a stack overflow. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
15	ERR ARM UNDEFINED INSTRUCTION EXCEPTION	Controller processor detected an unexpected exception. If this persists and to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 2 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
16	ERR ARM SWI EXCEPTION	Controller processor detected an unexpected exception. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
17	ERR ARM PREFETCH EXCEPTION	Controller processor detected an unexpected exception. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
18	ERR ARM ABORT EXCEPTION	Controller processor detected an unexpected exception. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
20	ERR AIC DEFAULT HANDLER	Controller processor detected an unexpected interrupt. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
21	ERR AIC SPURIOUS HANDLER	Controller processor detected an unexpected interrupt. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
22	ERR CAL DATA CRC FAILURE	Controller processor detected a calibration data checksum error. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.
23	ERR INVALID DRIFT INDEX AT CAL	Controller processor detected that the flow sensor drift check has failed. Flow sensor drift and calibration information can be monitored using the "D) Drift Screen" from the debug screen using the RASP utility, capture screen output to a file. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.
24	ERR UNRECOGNIZED CAL VERSION BY SW	Controller processor detected that the calibration table version check has failed. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 3 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
25	ERR DRIFT FLOW TOO HIGH	Controller processor detected that the flow sensor drift check has failed. Flow sensor drift and calibration information can be monitored using the "D) Drift Screen" from the debug screen using the RASP utility, capture screen output to a file. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.
27	ERR DRIFT PRESSURE TOO HIGH	Controller processor detected that the drift check on the primary pressure has failed. Pressure sensor drift and calibration information can be monitored using using the "D) Drift Screen" from the debug screen using the RASP utility, capture screen output to a file. 1. Attempt to re-calibrate the system. 2. If this fails,replace the controller PCB.
28	ERR CAL DATA BLANK	Controller processor detected that the calibration table is blank. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.
29	ERR DRIFT SECONDARY PRESSURE TOO HIGH	Controller processor detected that the drift check on the secondary pressure has failed. 1. Attempt to re-calibrate the system. 2. If this fails, replace the controller PCB.
30	ERR INVALID NVDATA SCHEMA	Controller processor detected an error in format of the calibration data in EEPROM. 1. Attempt to re-calibrate the system. 2. If this fails,replace the controller PCB.
31	ERR INVALID NVDATA LOCK	Controller processor detected an error accessing the calibration data in EEPROM. 1. Attempt to re-calibrate the system. 2. If this fails,replace the controller PCB.
32	ERR INVALID NVDATA CHECKSUM	Controller processor detected a checksum error on the calibration in EEPROM. 1. Attempt to re-calibrate the system. 2. If this fails,replace the controller PCB.
33	ERR NVDATA STORAGE ERROR	Controller processor detected that the data structure is bigger than the EEPROM device. 1. Attempt to re-calibrate the system. 2. If this fails,replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 4 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
34	ERR NVDATA QUEUE FULL	Controller processor detected that the queue to the EEPROM manager thread is full. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
35	ERR NVDATA READBACK FAILURE	Controller processor detected that a write operation to EEPROM failed the readback check. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
36	ERR NVDATA RANGE FAILURE	Controller processor detected that a write operation to EEPROM failed the range check for that data item. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
37	ERR CORRUPT RTC VALUE	Controller processor detected that the Real Time Clock time and the RTOS tick timer has drifted since it was last tested. When changing the time, this could happen and an RTC Failure Alarm maybe annuciated, this alarm can be reset by pressing Alarm Reset. No action necessary.
38	ERR RTC NOT TICKING	Controller processor detected that the Real Time Clock time and the RTOS tick timer has drifted significantly (>4 seconds) since it was last tested. When changing the time, this could happen and an RTC Failure Alarm maybe annuciated, this alarm can be reset by pressing Alarm Reset. No action necessary.
39	ERR UI QUEUE FULL	Controller processor detected a RTOS queue full condition. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
40	ERR INVALID BIST TEST CALL	Controller processor detected an invalid BIST test was attempted to be run. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 5 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
41	ERR PRESSURE REG OVER	Controller processor detected that a high pressure condition (i.e. 5 cmH20 above the IPAP or CPAP setting) lasted for greater than ten seconds. 1. Check for kicked tubes on the Primary pressure sensor. 2. Check for blockages near the Primary pressure sensor in the gas outlet port. 3. Replace the controller PCB. 4. If this persists replace the pneumatics subassembly (blower and valve).
42	ERR BIST THREAD LOCKED	Controller processor detected that the built in selftest thread is locked, i.e. it's not alive as expected. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
43	ERR ALARM VOLTAGE FAILURE	Controller processor detected that the backup alarm buzzer voltage test failed a limits check for greater than five seconds. 1. Enter Diagnostics mode and use the System Test screen, to check if the backup alarm can be turned on and off. 2. Replace the controller PCB.
44	ERR 12VREF FAILURE	Controller processor detected that the limits test on the 12V reference voltage signal failed. Replace the controller PCB.
45	ERR 5VREF FAILURE	Controller processor detected that the limits test on the 5V reference voltage signal failed. Replace the controller PCB.
46	ERR VBULK FAILURE	Controller processor detected that the limits test on the VBULK reference voltage signal failed. Replace the controller PCB.
47	ERR NEG15VREF FAILURE	Controller processor detected that the limits test on the -15V reference voltage signal failed. Replace the controller PCB.
48	ERR FL12 SENSOR RAILED	Controller processor detected that the limits test on the Flow sensor signal failed. 1. Replace the controller PCB. 2. If this persists replace the pneumatics subassembly (blower and valve)

Table 5-3: Significant Event Log: Event IDs (Sheet 6 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
49	ERR PV2 SENSOR FAILURE	Controller processor detected that the limits test on the secondary pressure sensor signal failed. 1. Replace the controller PCB. 2. If this persists replace the pneumatics subassembly (blower and valve)
50	ERR FLASH FAILURE	Controller processor detected a Boot Flash failure Replace the controller PCB.
51	ERR UNRECOGNIZED BOARD REV	Controller processor detected an out of range board revision Replace the controller PCB.
52	ERR MOTOR FAILURE	Controller processor detected a stalled blower, i.e. less than 1000 RPM. 1. If this persists replace the pneumatics subassembly (blower and valve). 2. If this persists, replace the controller PCB. The original pneumatics subassembly (blower and valve) should be re-inserted and the system retested and recalibrated
53	ERR BLOWER RPM FAILED TOLERANCE	Controller processor detected an out of tolerance blower speed, i.e. outside +/- 5500 RPM from the target blower speed for more than 5 seconds. 1. If this persists replace the pneumatics subassembly (blower and valve). 2. If this persists, replace the controller PCB. The original pneumatics subassembly (blower and valve) should be re-inserted and the system retested and recalibrated
54	ERR BLOWER OFF CURRENT HIGH	Controller processor detected a current draw of more than 100mA for more than 5 seconds, when the motor is powered off. 1. If this persists replace the pneumatics subassembly (blower and valve). 2. If this persists, replace the controller PCB. The original pneumatics subassembly (blower and valve) should be re-inserted and the system retested and recalibrated
55	ERR PRINTF BUFFER OVERFLOW	Controller processor detected a buffer overflow while outputting serial data. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 7 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
56	ERR BLOWER ON CURRENT HIGH	Controller processor detected a current draw of more than 3000mA for more than 10 seconds, when the motor is powered on. 1. If this persists replace the pneumatics subassembly (blower and valve) 2. If this persists, replace the controller PCB. 3. The original pneumatics subassembly (blower and valve) should be re-inserted and the system retested and recalibrated
57	ERR THERAPY EVENT QUEUE FULL	Controller processor detected a RTOS queue full condition. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
59	ERR P1 SENSOR RAILED	Controller processor detected that the limits test on the Primary pressure sensor signal failed. 1. Replace the controller PCB. 2. If this persists replace the pneumatics subassembly (blower and valve)
60	ERR P2 SENSOR RAILED	Controller processor detected that the limits test on the Secondary pressure sensor signal failed. 1. Replace the controller PCB. 2. If this persists replace the pneumatics subassembly (blower and valve)
61	ERR RTC BATTERY DEAD	Controller processor detected that the Real Time Clock time and the RTOS tick timer has drifted significantly since it was last tested. When changing the time, this could happen and an RTC Battery depleted technical alert maybe annuciated, this can be reset by pressing Alarm Reset. No action necessary.
62	ERR BLOWER RPM EXCEEDED MAX	Controller processor detected an out of tolerance blower speed, i.e. above 23337 RPM for more than 3 seconds. 1. If this persists replace the pneumatics subassembly (blower and valve) 2. If this persists, replace the controller PCB. The original pneumatics subassembly (blower and valve) should be re-inserted and the system retested and recalibrated
63	ERR INTERNAL WATCHDOG FAILURE	Controller processor detected an internal watchdog failure. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 8 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
64	ERR EXTERNAL WATCHDOG FAILURE	Controller processor detected an external watchdog failure. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
65	ERR UNEXPECTED WATCHDOG	Controller processor detected a watchdog failure, when it wasn't expecting one. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
67	ERR RTOS INIT FAILURE	Controller processor detected an initialisation failure when starting the RTOS. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
68	ERR SERIAL QUEUE FULL	Controller processor detected a RTOS queue full condition. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
69	ERR SNORE SAMPLING THREAD LOCKED	Controller processor detected that the snore sampling thread is locked, i.e. it's not alive as expected. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
70	ERR MAIN EXECUTION THREAD LOCKED	Controller processor detected that the main execution thread is locked, i.e. it's not alive as expected. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
71	ERR INTERNAL RAM FAILURE	Controller processor detected an internal RAM memory checksum error. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
72	ERR EVENT LOG QUEUE FULL	Controller processor detected a RTOS queue full condition. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 9 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
75	ERR IPC MSG TOO BIG	Controller processor detected an IPC message that was too big. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
76	ERR ALARM CAPACITOR FAILURE	Controller processor detected that the backup alarm buzzer capacitor test failed a limits check for greater than five minutes. 1. Enter Diagnostics mode and use the System Test screen, to check if the backup alarm can be turned on and off. 2. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
77	ERR HIGH PRESSURE REGULATION	Controller processor detected a high pressure condition and annuciated the "Hi P Reg" alarm. No action necessary. If this condition persists for greater than 10 seconds then the system will declare system error code 41
78	ERR LOW PRESSURE REGULATION	Controller processor detected a low pressure condition and annuciated the "Lo P Reg" alarm. No action necessary.
79	ERR_LOW_PRESSURE_SUPPORT_REGULATION	Unable to maintain Pressure Support. System Error declared after condition is present for one minute.
80	ERR IPC QUEUE FULL	Controller processor detected a RTOS queue full condition. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
81	ERR IPC INVALID MSGID	Controller processor detected an IPC message with an invalid message id. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 10 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
82	ERR IPC COMMS FAILURE	Controller processor detected an IPC message failure, it can be due to : a low level I2C receive error, a low level I2C transmit error or that the once a second I'm alive message was not received 1. Check the UI PCB to Controller PCB IPC 8-way multi-coloured cable. 2. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
83	ERR IPC CKSUM FAILURE	Controller processor detected an IPC message with an invalid checksum. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
84	SID TUI SOFT RESET IND	Controller processor detected an IPC soft reset message which was sent from the UI processor. 1. If this persists replace the controller PCB. 2. If replacing the Controller PCB doesn't fix the issue, replace the UI PCB.
85	SID TCB MODE SETTING FAIL	Controller processor detected that the mode setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
86	SID TCB ST IPAP SETTING FAIL	Controller processor detected that the ST mode IPAP setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
87	SID TCB ST EPAP SETTING FAIL	Controller processor detected that the ST mode EPAP setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
88	SID TCB ST RISE SETTING FAIL	Controller processor detected that the ST mode rise time setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 11 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
89	SID TCB ST RATE SETTING FAIL	Controller processor detected that the ST mode breath rate setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
90	SID TCB ST ITIME SETTING FAIL	Controller processor detected that the ST mode inspiratory time setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
91	SID TCB ST RAMP TIME SETTING FAIL	Controller processor detected that the ST mode ramp time setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
92	SID TCB ST RAMP START SETTING FAIL	Controller processor detected that the ST mode ramp start setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
93	SID TCB CPAP CPAP SETTING FAIL	Controller processor detected that the CPAP mode CPAP setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
94	SID TCB CPAP RAMP TIME SETTING FAIL	Controller processor detected that the CPAP mode ramp time setting change is not consistent with the value stored in EEPROM.
95	SID TCB CPAP RAMP START SETTING FAIL	Controller processor detected that the CPAP mode ramp start setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 12 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
96	SID TCB APNEA SETTING FAIL	Controller processor detected that the APNEA alarm setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
97	SID TCB APNEA RATE SETTING FAIL	Controller processor detected that the #APNEA rate alarm setting change is not consistent with the value stored in EEPROM. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.
98	ERR TUI SYSTEM ERROR IND	A system error has occurred on the UI processor and the controller processor has been informed of the fact. The controller processor shuts down. 1. If this persists replace the UI PCB 2. If replacing the UI PCB doesn't fix the issue, replace the controller PCB.
300	SID POST SUCCESSFUL	POST successful logged to the significant event log
301	SID POST BLOWER SWITCH CONTROL	UI processor detected that the blower switch control test failed during POST. 1. Check the blower switch control cable. 2. If this persists replace the controller PCB. 3. If replacing the Controller PCB doesn't fix the issue, replace the UI PCB.
302	SID POST SOFTWARE VERSION MISMATCH	UI processor detected that the UI and Controller processors have a mismatch in software versions. Ensure that the download of the released software completes without any errors reported.
303	SID POST TCB NOT RESPONDING	During POST the UI processor detected that the Controller processor did not synchronise with it, it timed out. Note: the system must be powered from mains as part of the software download procedure 1. Check the UI PCB to Controller PCB IPC 8-way multi-coloured cable. 2. If this persists replace the controller PCB. 3. If replacing the Controller PCB doesn't fix the issue, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 13 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
308	SID POST MAX SYSTEM RESETS	The system has detected either, 5 soft resets early in the UI processor POST or the system declaring a system error because 3 resets occurred in the last 24 hours. 1. Examine the significant event log, check the recent error codes and see if the Entries point to either a Controller PCB, Controller subassembly or UI PCB issue. 2. If this persists replace the UI PCB 3. If replacing the UI PCB doesn't fix the issue, replace the controller PCB.
309	SID POST INDICATOR FAIL	UI processor detected one of the leds is faulty during POST 1. Enter Diagnostics mode and use the System Test screen, to test the leds and identify which led is faulty. 2. If no led is found to be faulty and If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
310	SID POST ABNORMAL RESTAR	The system has detected that a soft reset has occurred unexpectedly. 1. Examine the significant event log, check the recent error codes and see if the entries point to either a Controller PCB, Controller subassembly or UI PCB issue. 2. If this persists replace the UI PCB 3. If replacing the UI PCB doesn't fix the issue, replace the controller PCB.
332	SID POST VBATT MONITOR FAIL	UI processor detected that the VBATT test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 14 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
333	SID POST 3 3V MONITOR FAIL	UI processor detected that the 3.3V test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
334	SID POST 5 0V MONITOR FAIL	UI processor detected that the 5.0V test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
335	SID POST 12V MONITOR FAIL	UI processor detected that the 12V test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
336	SID POST 18VIN MONITOR FAIL	UI processor detected that the 18VIN test failed during POST. Signal is only present while on mains. 1. Check if the problem exists when POST is run on mains and battery. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 15 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
337	SID POST 18VBOOST MONITOR FAIL	UI processor detected that the 18VBOOST test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
338	SID POST SUPERCAPV MONITOR FAIL	UI processor detected that the SUPERCAP test failed during POST. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when POST is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
339	SID POST HIGH INT TEMP VIO	UI processor detected that the enclosure high temperature test failed during POST. (> 60 degrees) 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
340	SID POST LOW INT TEMP VIO	UI processor detected that the enclosure low temperature test failed during POST. (< -3 degrees) 1. Ensure that the system is at room temperature or within the operating specifications (5-35° C / 41-95° F). 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 16 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
341	SID POST BOARD OVER TEMP MONITOR FAIL	UI processor detected that the board high temperature test failed during POST. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
342	SID POST BOARD UNDER TEMP MONITOR FAIL	UI processor detected that the board low temperature test failed during POST. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
343	SID POST BATTERY CHARGER READY MONITOR FAIL	UI processor detected that the battery charger ready signal test failed during POST. 1. Enter Diagnostics mode and use the Sensor Readings screen, to check the battery charger status bits. 2. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the battery. 3. If this persists replace the UI PCB
344	SID POST BATTERY CHARGER FAULT MONITOR FAIL	UI processor detected that the battery fault ready signal test failed during POST. 1. Enter Diagnostics mode and use the Sensor Readings screen, to check the battery charger status bits. 2. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replacethe battery. 3. If this persists replace the UI PCB

Table 5-3: Significant Event Log: Event IDs (Sheet 17 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
345	SID POST BATT THERMISTOR MONITOR FAIL	UI processor detected that the battery thermistor test failed during POST. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Check the battery is present 3. Check the battery wiring for shorts or opens. 4. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 5. Replace battery. 6. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
401	SID CBIT MONITOR RAM FAI	UI processor detected that the RAM memory test failed during CBIT. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
403	SID CBIT MONITOR PROGRAM CRC FAI	UI processor detected that the UI program memory checksum test failed during CBIT. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
409	SID CBIT INDICATOR FAI	UI processor detected that the led test failed during CBIT. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
417	SID CBIT HIGH INT TEMP ALARM	UI processor detected that the enclosure high temperature is high (> 58 degrees) 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 18 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
419	SID CBIT HIGH INT TEMP VIO	UI processor detected that the enclosure high temperature test failed during CBIT. (> 60 degrees). 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
426	SID CBIT LOW INT TEMP ALARM	UI processor detected that the enclosure low temperature is low (< 0 degrees). 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
432	SID CBIT 3.3V MONITOR FAIL	UI processor detected that the 3.3V test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
433	SID CBIT 5.0V MONITOR FAIL	UI processor detected that the 5.0V test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 19 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
434	SID CBIT 12V MONITOR FAIL	UI processor detected that the 12V test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
435	SID CBIT 18VIN MONITOR FAIL	UI processor detected that the 18VIN test failed during CBIT. 1. Signal is only present while on mains. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
436	SID CBIT 18VBOOST MONITOR FAIL	UI processor detected that the 18VBOOST test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
437	SID CBIT VBATT MONITOR FAIL	UI processor detected that the VBATT test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 20 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
438	SID CBIT BATT THERMISTOR MONITOR FAIL	UI processor detected that the battery thermistor test failed during CBIT. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Check the battery is present 3. Check the battery wiring for shorts or opens. 4. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 5. Replace battery. 6. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
439	SID CBIT BOARD OVER TEMP MONITOR FAIL	UI processor detected that the board high temperature test failed during CBIT. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
440	SID CBIT BLOWER SWITCH CONTROL FAIL	UI processor detected that the blower test failed during CBIT. 1. Enter Diagnostics mode and use the System Test screen, to check if the blower can be turned on. 2. Check the blower switch control cable 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB. 4. If this persists replace the controller PCB. 5. If replacing the Controller PCB doesn't fix the issue, replace the Blower.
441	SID CBIT IPC CBIT TEST FAIL	UI processor detected that the IPC test failed during CBIT. 1. Enter Diagnostics mode and use the System Test screen, to check if the blower can be turned on and off. Also check that the backup alarm can be turned on and off. 2. Check the UI PCB to Controller PCB IPC 8-way multi-coloured cable. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 21 of 22)

Significant Event Log: Event IDs (Continued)		
Code	**Short text for code**	**Comment / Corrective Action**
442	SID CBIT BOARD UNDER TEMP MONITOR FAIL	UI processor detected that the board low temperature test failed during CBIT. 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
443	SID CBIT LOW INT TEMP VIO	UI processor detected that the enclosure low temperature test failed during CBIT. (< -3 degrees). 1. Ensure that the system is at room temperature or within the operating specifications as per the Operator's Manual. 2. Enter Diagnostics mode and use the Sensor Readings screen, to check the temperature readings. 3. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
444	SID CBIT SUPERCAPV MONITOR FAIL	UI processor detected that the SUPERCAP test failed during CBIT. 1. If running on battery, ensure the system has a charged battery as per the setup section in the Operator's Manual. 2. Check if the problem exists when the system is run on mains and battery. 3. Enter Diagnostics mode and use the Sensor Readings screen, to check the adc readings. 4. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB.
445	SID CBIT SETTINGS TEST FAI	UI processor detected that the settings cross check test failed during CBIT. 1. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the UI PCB. 2. If this persists and leads to multiple resets and the system declaring a system error because too many errors occurred in 24 hours, replace the controller PCB.

Table 5-3: Significant Event Log: Event IDs (Sheet 22 of 22)

Chapter 6. Ventilator Communications

This section describes ventilator communications functions, including:

- Installing Service Center Tools and BiPAP Focus operational software onto the service PC.
- Phase 1 - Download controller board software to BiPAP Focus Ventilator.
- Phase 2- Download user interface software to the BiPAP Focus Ventilator.
- Reprogramming the BiPAP Focus serial number

The service PC must be equipped with Windows XP, and a USB port. The service PC must have administrator privileges to load the BiPAP Focus communications software.

CAUTION:	Be sure the ventilator is powered by the mains power and not running on battery power. This is to prevent possible power loss.
CAUTION:	The ventilator must be recalibrated following a software download.

Download Service Software to the Service PC

The most current revisions of the Service Center Tools Suite and BiPAP Focus operational software should be downloaded from the Respironics Service website.

1. Go to the URL **http://servicesoftware.respironics.com** and click on **Respironics Utility Tools**.
2. Click the download button next to **Service Center Tools Suite**.
3. Download this utility to the service PC.
4. Extract the file **Service-Center-Tools.exe** and launch the installation wizard.
5. Go to the URL **http://servicesoftware.respironics.com** and click on **Respironics Products Operating Software Updates.**
6. Click the download button next to **Bipap Focus Operational Software** to download the most current revision.

Installing Communications Software on the Service PC

Communications software allows the ventilator to communicate with the service PC. Follow these steps to install BiPAP Focus communications software onto a service PC:

1. Connect the universal serial bus (USB) cable between the service PC and ventilator.

NOTE:	Do not connect the USB cable through a hub or docking station. Using an intermediate connection causes communication errors.

2. Connect the female end of the serial communications cable to the service PC. Then connect the male end labeled Software/Rasp to the ventilator.

3. If the software drivers for the communications software are not already installed on the PC, the New Hardware Found Wizard appears when the ventilator is powered on. Select “Install software automatically” and click **Next**. Refer to Figure 6-1. If drivers are loaded proceed to step ‘1.’ on page 6-4.

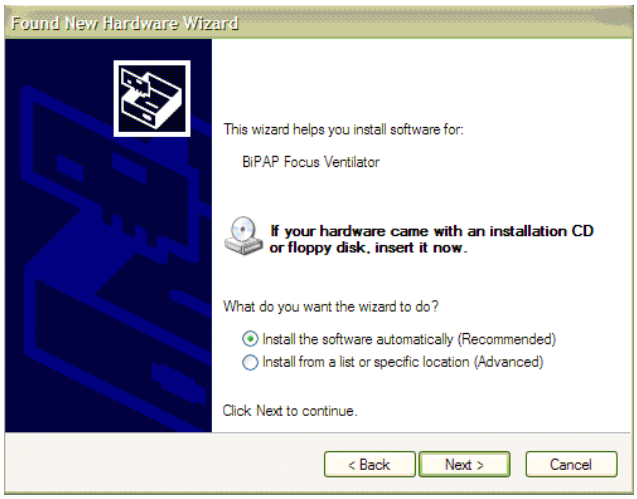
Found New Hardware Wizard
This wizard helps you install software for:
BiPAP Focus Ventilator
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Figure 6-1: New Hardware Wizard

4. Select the BEST driver then click **Next**. Refer to Figure 6-2.

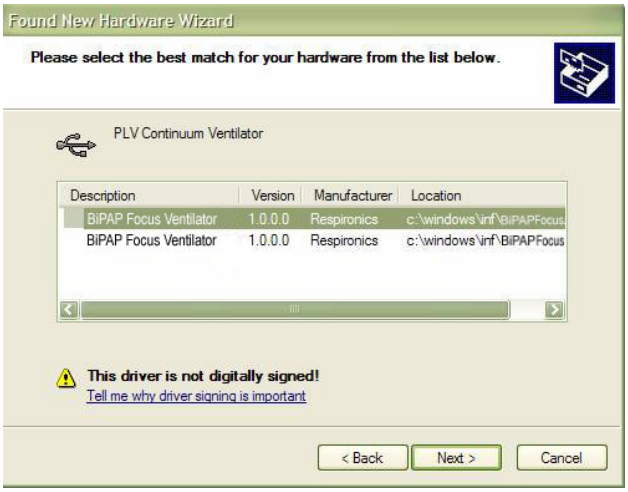

Figure 6-2: New Hardware Wizard - Selecting the driver

5. The software begins installing software on the PC. If the Windows XP compatibility warning appears click **Continue Anyway**. Refer to Figure 6-3.

Found New Hardware Wizard
Please wait while the wizard installs the software...
BiPAP Focus Ventilator
Hardware Installation
The software you are installing for this hardware:
BiPAP Focus Ventilator
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

Figure 6-3: New Hardware Wizard - Windows XP Warning

6. When the software completes the software installation the Completing the Found New Hardware Wizard dialog box appears. Click **Finish**. Refer to Figure 6-4.

Figure 6-4: Completing the Found New Hardware Wizard dialog box

7. Once the drivers for software downloads are complete the process for loading the BiPAP Focus can begin.

Starting the BiPAP Focus Wizard

The BiPAP Focus Wizard is comprised of two phases:

- Phase 1 - Downloading controller board software to the ventilator.
- Phase 2 - Downloading user interface software to the ventilator.

1. Start the ventilator in Download Mode. Press the Standby key while pressing the Up and Down arrow keys.

2. Navigate to the wizard executable program: Install_Focus_Software.exe

3. Double-click on **Install_Focus_Software.exe**. This will open Phase 1 of the of the wizard.

Downloading Controller Board Software to the Ventilator

Follow these steps to download controller board software from the computer to the ventilator:

1. This is the Phase 1 Start screen. The screen then shows the order of installation and Warns *"Ensure that there is no patient connected."* From the *Phase 1 Start* screen click **Next**.

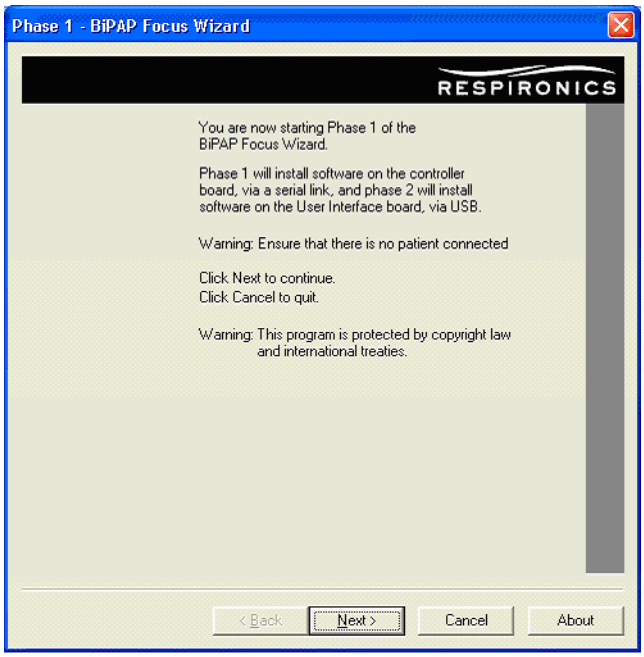
Phase 1 - BiPAP Focus Wizard
RESPIRONICS
You are now starting Phase 1 of the BiPAP Focus Wizard.
Phase 1 will install software on the controller board, via a serial link, and phase 2 will install software on the User Interface board, via USB.
Warning: Ensure that there is no patient connected
Click Next to continue.
Click Cancel to quit.
Warning: This program is protected by copyright law and international treaties.
< Back
Next >
Cancel
About

Figure 6-5: Phase 1 Start Screen

2. Select the desired option from the list and click **Next**.

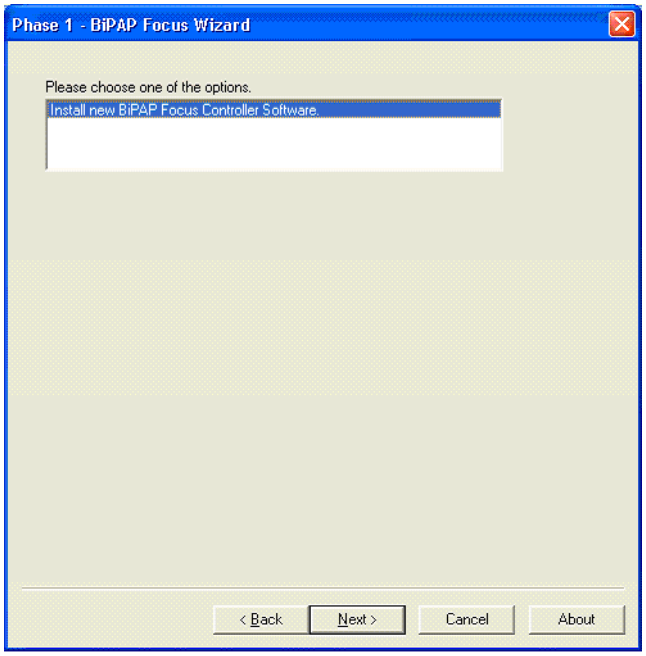

Figure 6-6: BiPAP Focus Controller Software Selection Screen

3. The screen then shows cable connection information (Figure 6-7): Verify the cables are connected properly then click **Next**.

NOTE:	Do not connect the USB cable through a hub or docking station. Using an intermediate connection causes communication errors.
NOTE:	The female end of the serial communications cable should be connected to the service PC. The male end, labeled Software/Rasp, should be connected to the ventilator.

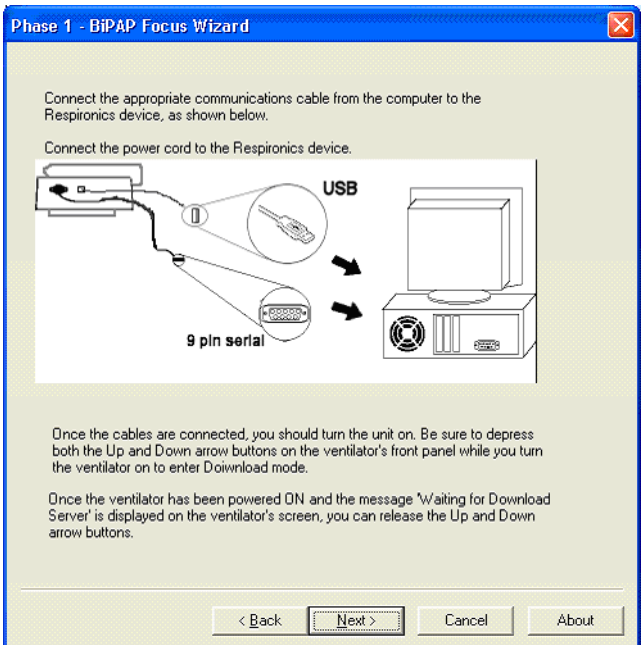
Phase 1 - BiPAP Focus Wizard
Connect the appropriate communications cable from the computer to the Respironics device, as shown below.
Connect the power cord to the Respironics device.
USB
9 pin serial
Once the cables are connected, you should turn the unit on. Be sure to depress both the Up and Down arrow buttons on the ventilator's front panel while you turn the ventilator on to enter Doiwnload mode.
Once the ventilator has been powered ON and the message 'Waiting for Download Server' is displayed on the ventilator's screen, you can release the Up and Down arrow buttons.
< Back
Next >
Cancel
About

Figure 6-7: Communications Cable Connection Screen

4. The screen shows the controller board software installation process.

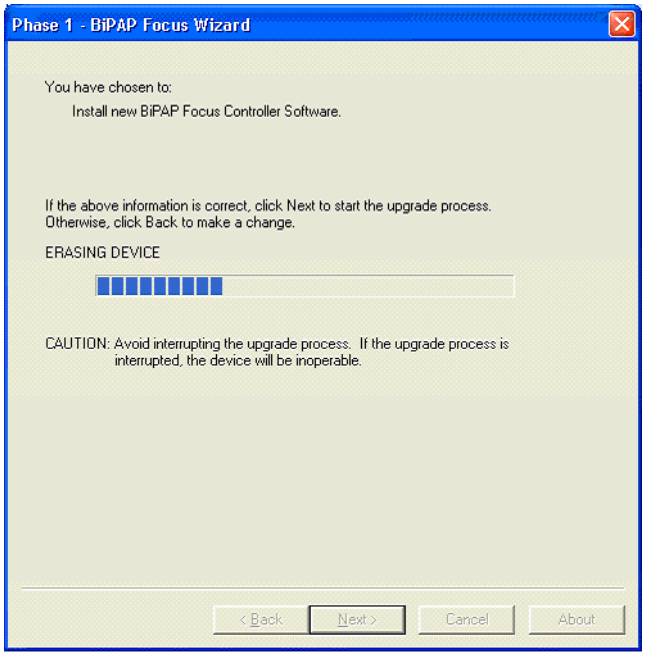
Phase 1 - BiPAP Focus Wizard
You have chosen to:
Install new BiPAP Focus Controller Software.
If the above information is correct, click Next to start the upgrade process.
Otherwise, click Back to make a change.
ERASING DEVICE
CAUTION: Avoid interrupting the upgrade process. If the upgrade process is interrupted, the device will be inoperable.
< Back
Next >
Cancel
About

Figure 6-8: Software Installation Progress Screen

5. Once the controller board software installation is complete, a completion screen (Figure 6-9) is displayed. Click **Finish.**

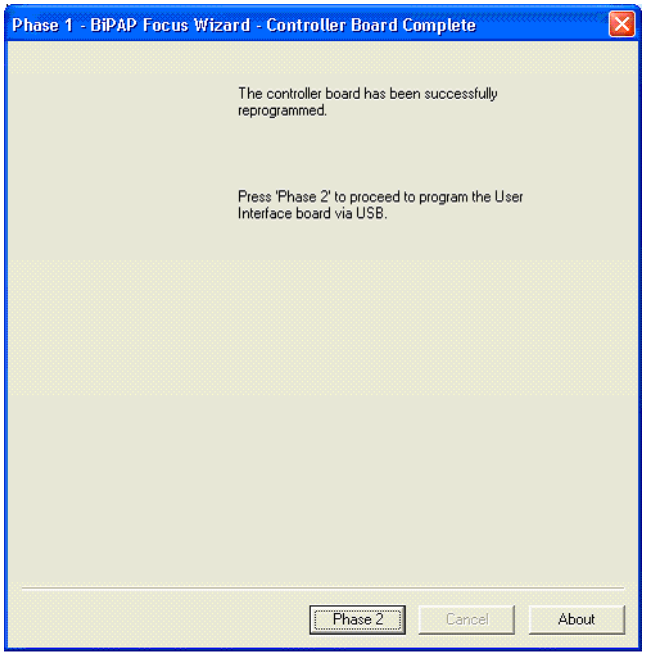
Phase 1 - BiPAP Focus Wizard - Controller Board Complete
The controller board has been successfully reprogrammed.
Press 'Phase 2' to proceed to program the User Interface board via USB.
Phase 2
Cancel
About

Figure 6-9: BiPAP Focus Controller Board Software Installation Finished

Downloading UI Software to the Ventilator

During this portion of the software installation the alarm enunciator will sound. Hearing protection may be desired.

1. Follow the onscreen instructions to install the software: confirm that no patient is connected to the ventilator and that the ventilator is in download mode (Figure 6-10). Click **Next**.

BiPAP Focus Wizard
Welcome to phase 2 of the BiPAP Focus Wizard!
This wizard will guide you through phase 2 of installing new software into a BiPAP Focus ventilator. Phase 2 will install software on the User Interface board.
Before you can proceed, you should confirm that there is no patient connected to the BiPAP Focus ventilator, and that the ventilator is in Download mode.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-10: Phase 2 welcome

2. Connect a universal serial bus (USB) cable between the service PC and ventilator. If necessary choose the option to display more detailed connection instructions (Figure 6-11). Click **Next**.

NOTE:	Do not connect the USB cable through a hub or docking station. Using an intermediate connection causes communication errors.
NOTE:	The female end of the serial communications cable should be connected to the service PC. The male end, labeled Software/Rasp, should be connected to the ventilator.

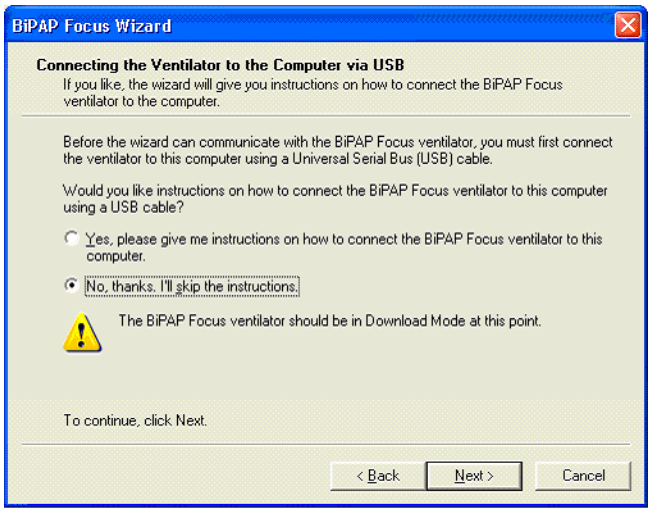
BiPAP Focus Wizard
Connecting the Ventilator to the Computer via USB
If you like, the wizard will give you instructions on how to connect the BiPAP Focus ventilator to the computer.
Before the wizard can communicate with the BiPAP Focus ventilator, you must first connect the ventilator to this computer using a Universal Serial Bus (USB) cable.
Would you like instructions on how to connect the BiPAP Focus ventilator to this computer using a USB cable?
Yes, please give me instructions on how to connect the BiPAP Focus ventilator to this computer.
No, thanks. I'll skip the instructions.
The BiPAP Focus ventilator should be in Download Mode at this point.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-11: Connecting the Ventilator to the Service PC

3. Click **Next**.

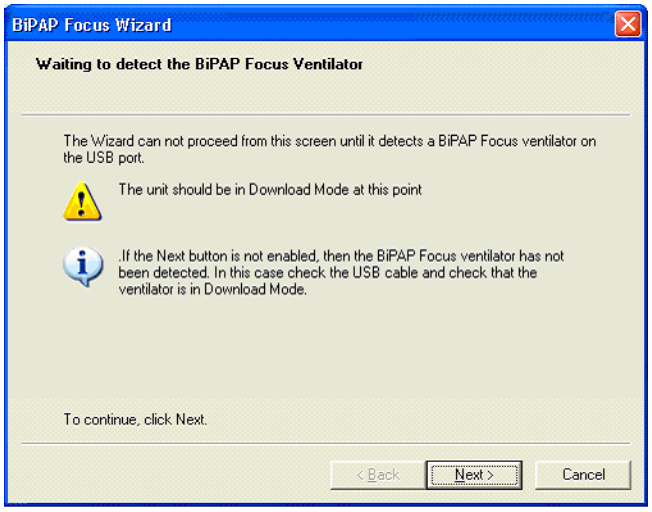
BiPAP Focus Wizard
Waiting to detect the BiPAP Focus Ventilator
The Wizard can not proceed from this screen until it detects a BiPAP Focus ventilator on the USB port.
The unit should be in Download Mode at this point
.If the Next button is not enabled, then the BiPAP Focus ventilator has not been detected. In this case check the USB cable and check that the ventilator is in Download Mode.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-12: Powering Up the Ventilator

4. The software connection process dialog box appears identifying the steps including, Searching for the ventilator, retrieving ventilator configuration information, and installing the communications software (Figure 6-13). Click **Next**.

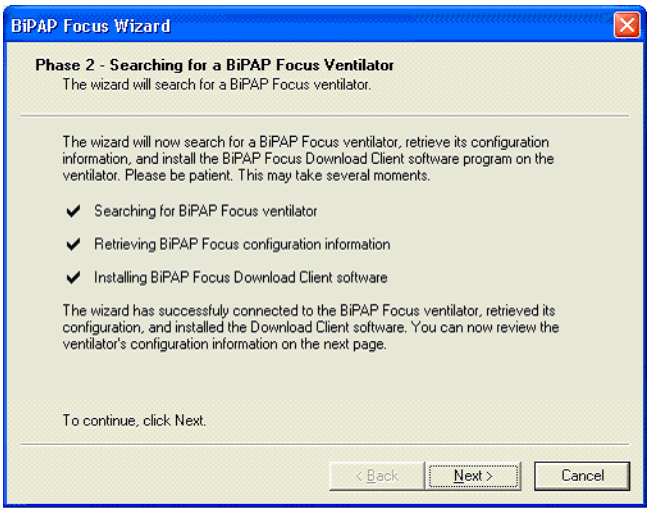
BiPAP Focus Wizard
Phase 2 - Searching for a BiPAP Focus Ventilator
The wizard will search for a BiPAP Focus ventilator.
The wizard will now search for a BiPAP Focus ventilator, retrieve its configuration information, and install the BiPAP Focus Download Client software program on the ventilator. Please be patient. This may take several moments.
Searching for BiPAP Focus ventilator
Retrieving BiPAP Focus configuration information
Installing BiPAP Focus Download Client software
The wizard has successfuly connected to the BiPAP Focus ventilator, retrieved its configuration, and installed the Download Client software. You can now review the ventilator's configuration information on the next page.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-13: Communications Software Connection

5. Click **Next**, the ventilator configuration dialog box appears (Figure 6-14).

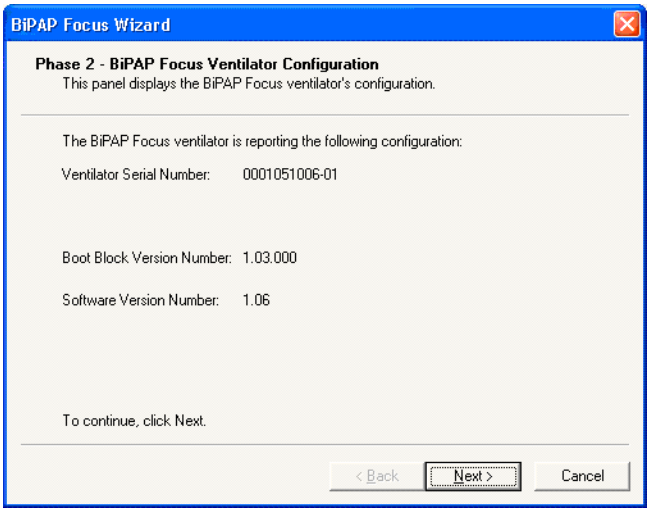
BiPAP Focus Wizard
Phase 2 - BiPAP Focus Ventilator Configuration
This panel displays the BiPAP Focus ventilator's configuration.
The BiPAP Focus ventilator is reporting the following configuration:
Ventilator Serial Number: 0001051006-01
Boot Block Version Number: 1.03.000
Software Version Number: 1.06
To continue, click Next.
< Back
Next >
Cancel

Figure 6-14: Ventilator Configuration

6. Click **Next**, the *Ventilator Management* dialog box appears (Figure 6-15), which allows loading new software into the ventilator configuration or selecting Advanced configuration operations.

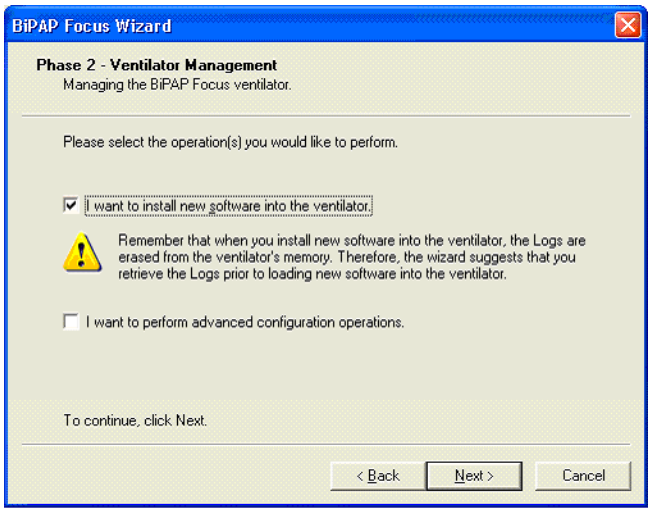
BiPAP Focus Wizard
Phase 2 - Ventilator Management
Managing the BiPAP Focus ventilator.
Please select the operation(s) you would like to perform.
I want to install new software into the ventilator.
Remember that when you install new software into the ventilator, the Logs are erased from the ventilator's memory. Therefore, the wizard suggests that you retrieve the Logs prior to loading new software into the ventilator.
I want to perform advanced configuration operations.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-15: Ventilator Management Screen

7. Check one of the ventilator options then click **Next**.

8. The *BiPAP Focus Software Selection* screen appears. Select the software version from the list and click **Next**.

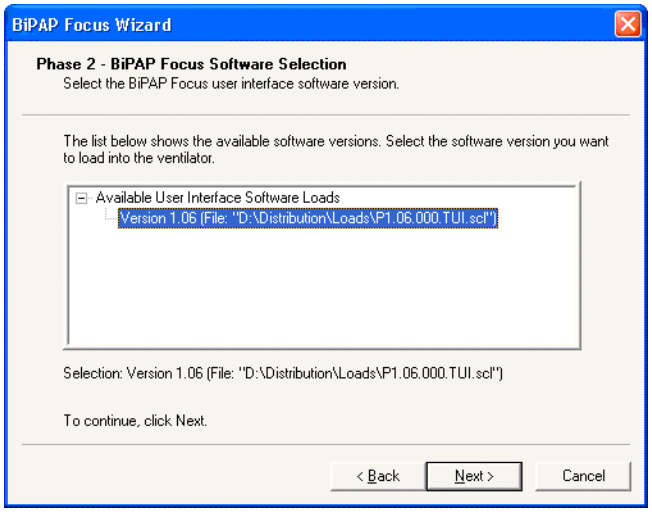
BiPAP Focus Wizard
Phase 2 - BiPAP Focus Software Selection
Select the BiPAP Focus user interface software version.
The list below shows the available software versions. Select the software version you want to load into the ventilator.
Available User Interface Software Loads
Version 1.06 (File: "D:\Distribution\Loads\P1.06.000.TUI.scl")
Selection: Version 1.06 (File: "D:\Distribution\Loads\P1.06.000.TUI.scl")
To continue, click Next.
< Back
Next >
Cancel

Figure 6-16: BiPAP Focus UI Software Selection Screen

9. The screen then displays user interface software download information (Figure 6-17): verify that this information is correct then click **Next**.

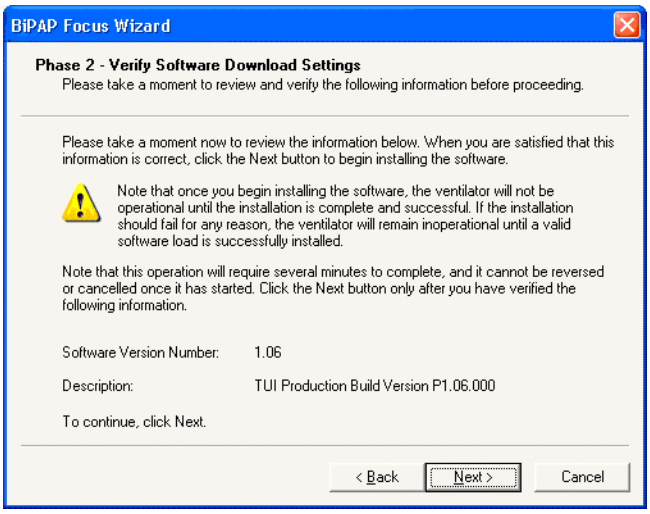
BiPAP Focus Wizard
Phase 2 - Verify Software Download Settings
Please take a moment to review and verify the following information before proceeding.
Please take a moment now to review the information below. When you are satisfied that this information is correct, click the Next button to begin installing the software.
Note that once you begin installing the software, the ventilator will not be operational until the installation is complete and successful. If the installation should fail for any reason, the ventilator will remain inoperational until a valid software load is successfully installed.
Note that this operation will require several minutes to complete, and it cannot be reversed or cancelled once it has started. Click the Next button only after you have verified the following information.
Software Version Number: 1.06
Description: TUI Production Build Version P1.06.000
To continue, click Next.
< Back
Next >
Cancel

Figure 6-17: Verify Software Download Settings

10. The screen then displays the user interface software installation process, including erasing old user interface software, installing new interface software, and updating software configuration information (Figure 6-18). Click **Next**.

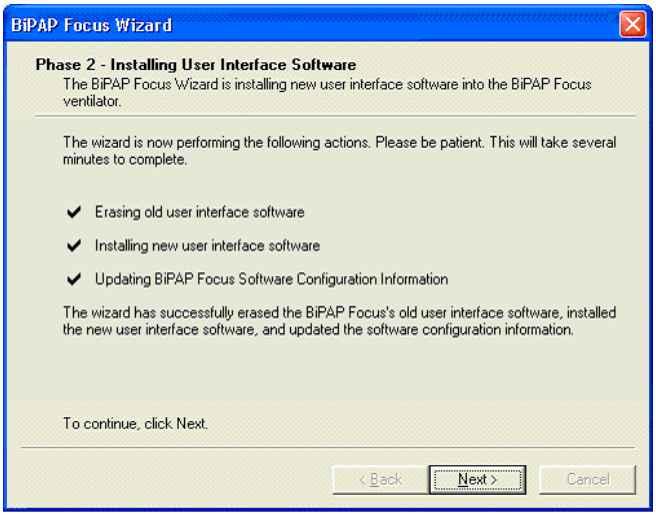
BiPAP Focus Wizard
Phase 2 - Installing User Interface Software
The BiPAP Focus Wizard is installing new user interface software into the BiPAP Focus ventilator.
The wizard is now performing the following actions. Please be patient. This will take several minutes to complete.
Erasing old user interface software
Installing new user interface software
Updating BiPAP Focus Software Configuration Information
The wizard has successfully erased the BiPAP Focus's old user interface software, installed the new user interface software, and updated the software configuration information.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-18: New Software Installation

11. Once the user interface software installation is complete, a completion screen (Figure 6-19) is displayed. Click **Finish**.

BiPAP Focus Wizard
BiPAP Focus Wizard Phase 2 Completion
You have performed the following operations from phase 2:
You completed phase 2 of software installation for the user interface.
Click Finish to Exit
< Back
Finish
Cancel

Figure 6-19: Phase 1 Complete

12. Once the download is complete the ventilator will reset.
13. Disconnect the communication cables.
14. Using the power switch on the back panel turn on power to the device.
15. Press the round Standby key on the front key panel to restart the BiPAP Focus.
16. The ventilator must now be recalibrated. Proceed to Chapter 7: Performance Verification.

Reprogramming the BiPAP Focus Serial Number

The serial number of each BiPAP Focus ventilator is stored in nonvolatile memory on its UI PCB, and must be reprogrammed if you replace the UI PCB.

1. Be sure the serial number of the unit has been written down before reprogramming the serial number.
2. Navigate to the wizard executable program: TUI_download_wizard.exe
3. Double-click on **TUI_download_wizard.exe**. This will open Phase 2 of the of the wizard.

To program the serial number:

1. Follow the onscreen instructions to install the software: confirm that no patient is connected to the ventilator and that the ventilator is in download mode (Figure 6-20). Click **Next**.

BiPAP Focus Wizard
Welcome to phase 2 of the BiPAP Focus Wizard!
This wizard will guide you through phase 2 of installing new software into a BiPAP Focus ventilator. Phase 2 will install software on the User Interface board.
Before you can proceed, you should confirm that there is no patient connected to the BiPAP Focus ventilator, and that the ventilator is in Download mode.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-20: Phase 2 welcome

2. Connect a universal serial bus (USB) cable between the service PC and ventilator. If necessary choose the option to display more detailed connection instructions (Figure 6-21). Click **Next**.

NOTE:	Do not connect the USB cable through a hub or docking station. Using an intermediate connection causes communication errors.
NOTE:	The female end of the serial communications cable should be connected to the service PC. The male end, labeled Software/Rasp, should be connected to the ventilator.

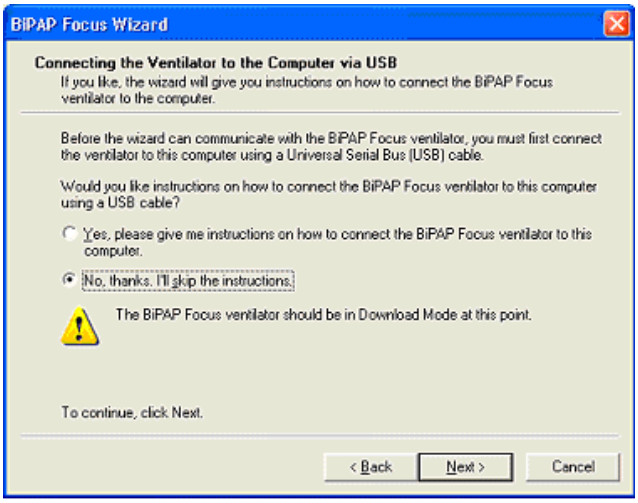
BiPAP Focus Wizard
Connecting the Ventilator to the Computer via USB
If you like, the wizard will give you instructions on how to connect the BiPAP Focus ventilator to the computer.
Before the wizard can communicate with the BiPAP Focus ventilator, you must first connect the ventilator to this computer using a Universal Serial Bus (USB) cable.
Would you like instructions on how to connect the BiPAP Focus ventilator to this computer using a USB cable?
Yes, please give me instructions on how to connect the BiPAP Focus ventilator to this computer.
No, thanks. I'll skip the instructions.
The BiPAP Focus ventilator should be in Download Mode at this point.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-21: Connecting the Ventilator to the Service PC

3. Once the ventilator and PC are connected, power up the ventilator while holding down the Up and Down arrow buttons until the ventilator displays the message Waiting to detect the BiPAP Focus Ventilator (Figure 6-22). Click **Next**.

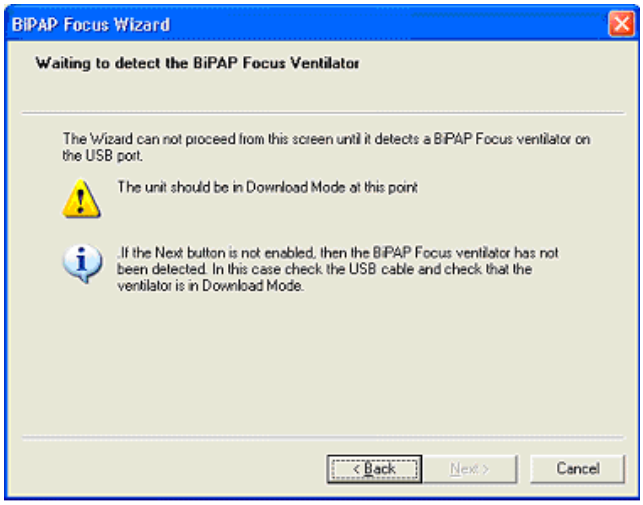
BiPAP Focus Wizard
Waiting to detect the BiPAP Focus Ventilator
The Wizard can not proceed from this screen until it detects a BiPAP Focus ventilator on the USB port.
The unit should be in Download Mode at this point
If the Next button is not enabled, then the BiPAP Focus ventilator has not been detected. In this case check the USB cable and check that the ventilator is in Download Mode.
< Back
Next >
Cancel

Figure 6-22: Powering Up the Ventilator

4. The software connection process dialog box appears identifying the steps including, Searching for the ventilator, retrieving ventilator configuration information, and installing the communications software (Figure 6-23).

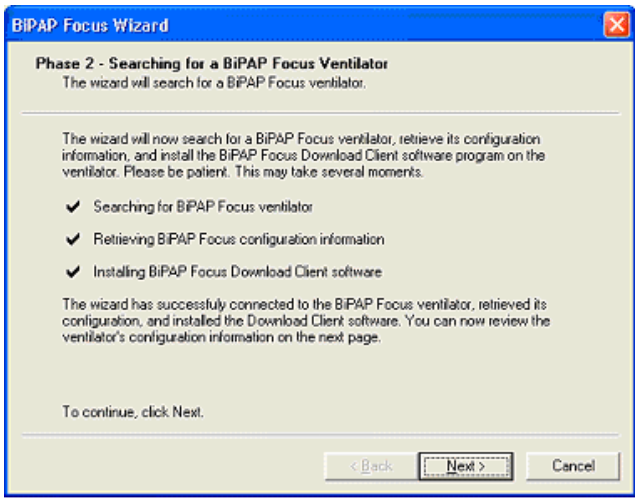
BiPAP Focus Wizard
Phase 2 - Searching for a BiPAP Focus Ventilator
The wizard will search for a BiPAP Focus ventilator.
The wizard will now search for a BiPAP Focus ventilator, retrieve its configuration information, and install the BiPAP Focus Download Client software program on the ventilator. Please be patient. This may take several moments.
Searching for BiPAP Focus ventilator
Retrieving BiPAP Focus configuration information
Installing BiPAP Focus Download Client software
The wizard has successfuly connected to the BiPAP Focus ventilator, retrieved its configuration, and installed the Download Client software. You can now review the ventilator's configuration information on the next page.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-23: Communications Software Connection

5. Click Next, the Ventilator Management dialog box appears (Figure 6-24), which allows loading new software into the ventilator configuration or selecting Advanced configuration operations.

6. Fill the "I want to perform advanced configuration operations." check box then click **Next**, or click **Cancel** to exit.

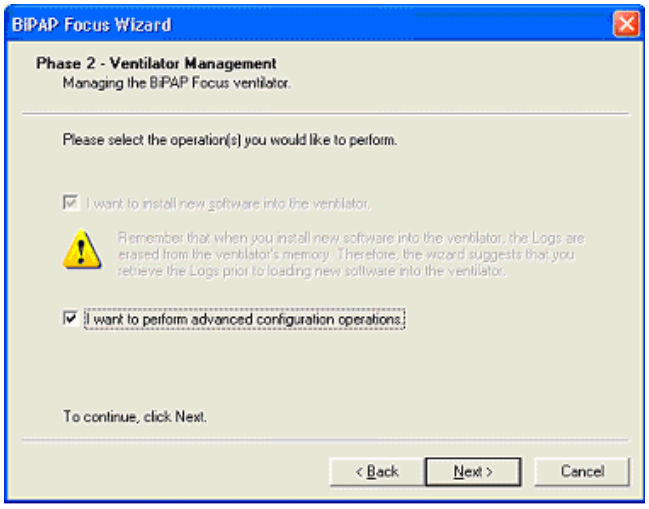
BiPAP Focus Wizard
Phase 2 - Ventilator Management
Managing the BiPAP Focus ventilator.
Please select the operation(s) you would like to perform.
I want to install new software into the ventilator.
Remember that when you install new software into the ventilator, the Logs are erased from the ventilator's memory. Therefore, the wizard suggests that you retrieve the Logs prior to loading new software into the ventilator.
I want to perform advanced configuration operations.
To continue, click Next.
< Back
Next >
Cancel

Figure 6-24: Ventilator Management Screen

7. The BiPAP Focus Update Ventilator Configuration screen appears. Fill the Ventilator Serial Number check box then enter the serial number in the text box.

8. Click **Next**.

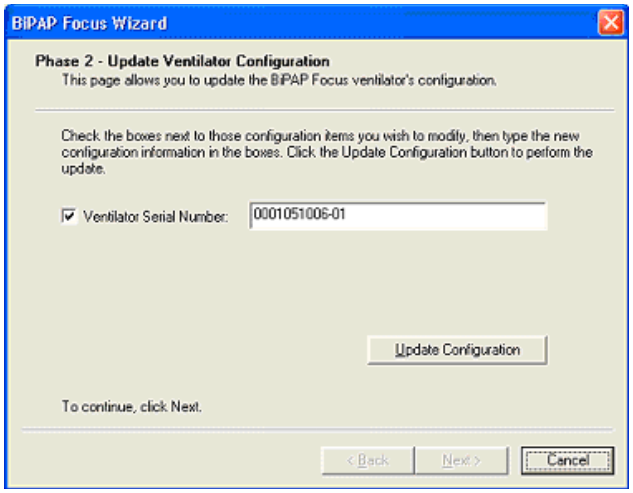
BiPAP Focus Wizard
Phase 2 - Update Ventilator Configuration
This page allows you to update the BiPAP Focus ventilator's configuration.
Check the boxes next to those configuration items you wish to modify, then type the new configuration information in the boxes. Click the Update Configuration button to perform the update.
Ventilator Serial Number:
0001051006-01
Update Configuration
To continue, click Next.
< Back
Next >
Cancel

Figure 6-25: Update Ventilator Configuration Screen

9. The screen then displays a Configuration Update Successful message. Click **Next**.

10. The Wizard Completion screen appears. Click **Finish**.

BiPAP Focus Wizard
BiPAP Focus Wizard Phase 2 Completion
You have performed the following operations from phase 2:
You successfully updated the BiPAP Focus ventilator's configuration information.
Click Finish to Exit
< Back
Finish
Cancel

Figure 6-26: Phase 2 Complete

11. Once the download is complete the ventilator will reset.

12. Disconnect the communication cables.

13. The ventilator must now be recalibrated. Proceed to Chapter 7: Performance Verification.

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Chapter 7. Performance Verification

The performance verification verifies the integrity of the ventilator's critical components using external measurement devices. The performance verification consists of several tests (Table 7-1).

Performance Verification Tests	
Test number	**Description**
1	Electical Safety
2	Alarm / LED Test
3	BiPAP Focus System Run-In
4	Real Time Clock Calibration
5	BiPAP Focus Calibration
6	Performance Verification

Table 7-1: Performance Verification: Required Tests

The type of service performed determines which of the tests are required (Table 7-2). Run required tests in order.

Performance Verification: Required Tests	
Service performed	**Required tests**
Annual or two-year preventive maintenance	All.
Removal/replacement	
Controller PCB	All.
User Interface PCB	All.
Internal battery	Alarm/keypad/LED, power transition.
VGA PCB	Electical Safety, Alarm/keypad/LED, power transition.
LCD assembly	All.
keypad	Electical Safety, Alarm/keypad/LED.
main alarm, backup alarm, or remote alarm connector	Electical Safety, Alarm/keypad/LED, power transition.

Table 7-2: Performance Verification: Required Tests

Required Test Equipment

Table 7-3 summarizes the test equipment required, and Table 7-4 summarizes the service accessories required for the performance verification. Check the calibration status of all test equipment before use.

Required Test Equipment for Performance Verification

Description	Recommended Manufacturer/Model
Digital multimeter (DMM) and frequency counter accurate to three decimal places	Local supplier
Electrical safety analyzer	Dale LT 5440 or equivalent
Pneumatic calibration analyzer(s) capable of measuring low pressure (cmH2O), flow rate (LPM), volume (Liters BTPS), and respiratory rate	Respironics P/N 1012598 or equivalent
Utility Software Calibration and testing of the BiPAP Focus requires the use of Respironics Utility Software	Log on to http:// servicesoftware.respironics.com and download the Utility Software onto your PC.

Table 7-3: Required Test Equipment for Performance Verification

Required Service Accessories for Performance Verification

Description	Part Number
Adapters, oxygen enrichment (quantity 2)	Respironics P/N 312710 or equivalent
Bacteria filter, reusable inspiratory	Respironics P/N 1003847
Connector, 22-mm (quantity 2)	Respironics P/N 1006242 or equivalent
Coupling, silicone (quantity 2)	Respironics P/N C06348
Pressure test adapter	Respironics P/N 312710
Reusable Patient Tubing Circuit	Respironics P/N C06122
Test orifice, RP20	Michigan Instruments or equivalent
0.25" Test Orifice	Respironics P/N 332353
Silicone cork	Respironics P/N 1001735
BiPAP Focus Communications Cable Kit (USB & DB9)	Respironics P/N 1030010
Tee, plastic w/silicone coupling	Respironics P/N C06260
Tubing, silicone, 3/16-in. ID x 6.5 ft. PAP	Respironics P/N C06686

Table 7-4: Required Service Accessories for Performance Verification

Preliminary Cleaning, Inspection, and Setup

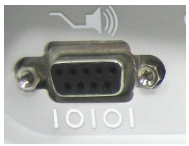
WARNING: To prevent disease transmission, use protective equipment when handling contaminated bacteria filters or other patient accessories. Follow manufacturers' labeling and institutional guidelines for disposal of contaminated accessories.

1. Before servicing the ventilator, clean and inspect as follows:
   - Remove humidifier connections from the ventilator, if applicable.
   - Visually inspect the exterior of the ventilator for damage. Replace damaged parts as needed.
   - Clean the ventilator exterior as described in the *BiPAP Focus Clinical Manual*.
   - Clean the ventilator interior using an ESD-safe vacuum.
   - Remove and inspect the air inlet filters. Clean or replace as described in the *BiPAP Focus Clinical Manual*.
2. Connect a standard USB cable between the service PC and the USB port on the back panel of the ventilator.
3. Download and execute the **Service Center Tools** software (http://servicesoftware.respironics.com) and follow the prompts to retrieve the significant event log (the log includes the ventilator's configuration and hour meter reading).
4. Print the significant event log and attach to the Performance Verification Data Form (page 7-29).

Electrical Safety Test

The electrical safety test verifies that the ground resistance and forward and reverse leakage current are within specified limits. Record the following information on Performance Verification Data Form (page 7-29).

Use the DB9 shell on the Nurse call station / serial communications port at the back of the ventilator to connect the electrical safety analyzer to ventilator ground.



1. Check that the ground resistance < 0.2 ohm (Ω).
2. Turn ventilator on and wait until gas delivery begins.
3. Check that the forward and reverse leakage current is < 100 microamperes (µA) for ventilators connected to 100-120 V), or < 300 µA for ventilators connected to 220-240 V.
4. The electrical safety test is complete.

Alarm/LED Test

The Alarm/LED Test confirms the alarms and LEDs are working properly. Record the following information on Performance Verification Data Form (page 7-29).

1. Connect system to AC power and start the ventilator in Diagnostic Mode.
2. Confirm that the ON AC POWER LED is on.
3. Remove the AC power from the back of the ventilator for at least one minute then reconnect the AC power to the back of the ventilator.
4. Confirm the green BATTERY CHARGING LED illuminates.
5. Navigate to the System Test screen.
6. Use the Up/Down keys to highlight the Primary Audible alarm then press the Enter key to test the alarm.
7. Use the Up/Down keys to highlight Backup Audible alarm then press the Enter key to test the alarm.

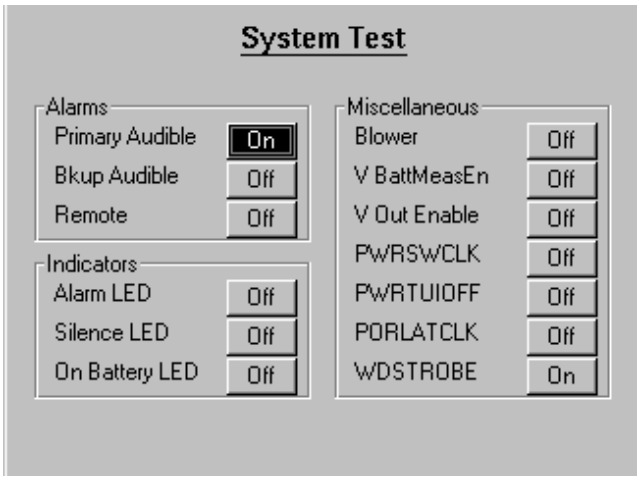
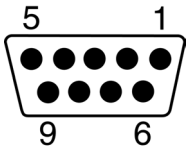


Figure 7-1: Diagnostic Mode: System Test Screen

To test the Remote alarm use a Digital Multimeter (DMM) with the Nurse call station / serial communications port.



- When pins 1 and 6 are used, the relay is open during normal operation, and closed during an alarm condition including loss of power.
- When pins 1 and 9 are used, the relay is closed during normal operation, and open during an alarm condition including loss of power.

8. Set the DMM to measure resistance.

9. Turn the ventilator around and connect test leads to pins 1 & 6.
   - With the Remote Alarm switch in the OFF position (Refer to Figure 7-1), resistance should be infinite resistance (open circuit).
   - Press the Enter key on the front panel. With the Remote Alarm switch in the ON position, confirm the DMM displays 0±3 ohm (Ω) (closed circuit).

10. connect test leads to pins 1 & 9.
    - With the Remote Alarm switch in the ON position (Refer to Figure 7-1), resistance should be infinite resistance (open circuit).
    - Press the Enter key on the front panel. With the Remote Alarm switch in the OFF position, confirm the DMM displays 0±3 ohm (Ω) (closed circuit).

11. Remove the DMM leads and return to the System Test screen.

12. Use the Up/Down keys to highlight the Alarm LED then press the Enter key to test Alarm LED.

13. Use the Up/Down keys to highlight the Silence LED then press the Enter key to test Silence LED.

14. Use the Up/Down keys to highlight the ON Battery LED then press the Enter key to test ON Battery LED.

BiPAP Focus System Run-in

Before the BiPAP Focus can be calibrated, the device must be run-in for at least 35 minutes to avoid possible calibration failures.

Equipment Required

0.25" Test Orifice (RI p/n 332353)

Procedure

1. Connect the test orifice to the outlet port of the unit.

2. Enter the therapy setup menu and set the IPAP pressure to 20 cmH_2O, and EPAP to 20 cmH_2O.

3. Run the unit for at least 35 minutes before performing the calibration.

Real-time Clock Calibration

The BiPAP Focus will record and track several different parameters (e.g. patient pressures, apnea events, when and how the device is used, error codes, etc.). To do this in a logical manner and for a technician or therapist to know exactly when a certain event has occurred, the BiPAP Focus runs and records events in real-time. This time is checked and compared to your computers time when running the calibration software. If the time does not match, the calibration will fail. Therefore, you must perform the real-time clock calibration before you proceed with the BiPAP Focus calibration.

Equipment Required

- BiPAP Focus Communications Cable Kit (P/N 1030010)
- Utility Software

Procedure

1. Ensure AC power is connected to the BiPAP Focus.
2. Remove the bacteria filter from the ventilator if it is connected.
3. Start the ventilator in Normal mode. Be sure the vent is in S/T mode.
4. Connect the universal serial bus (USB) cable between the service PC and ventilator.

NOTE:	Do not connect the USB cable through a hub or docking station. Using an intermediate connection causes communication errors.

5. Connect the female end of the serial communications cable to the service PC. Then connect the male end labeled Software/Rasp to the ventilator.
6. Open the Service Center Tools and select “Read Serial Number & Model number”. Write down the serial number and the model number for use later on during the calibration.
7. Open the Service Center Tools and select “Real-time Clock Calibration”.
8. Click the red “Set Clock/Verify Clock” button in the upper left-hand corner to begin calibration (the button will turn green).

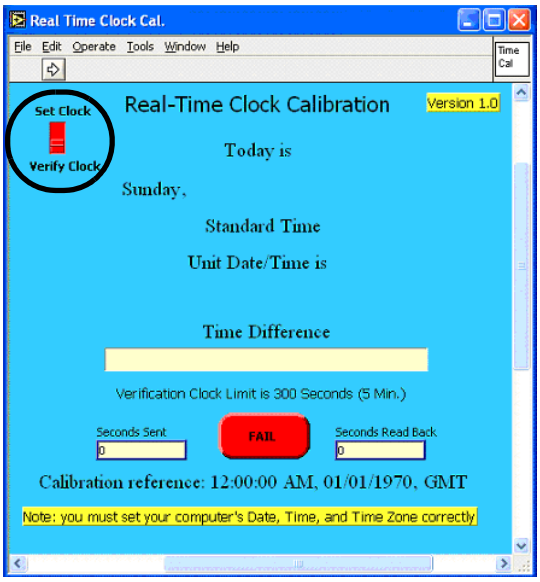


Figure 7-2: Begin Calibration

9. In the upper left-hand corner below the menu bar, click the white run time arrow. The program will set the appropriate date and time on the BiPAP Focus.

10. When the program has finished, a green "PASS" indicator will appear at the bottom.

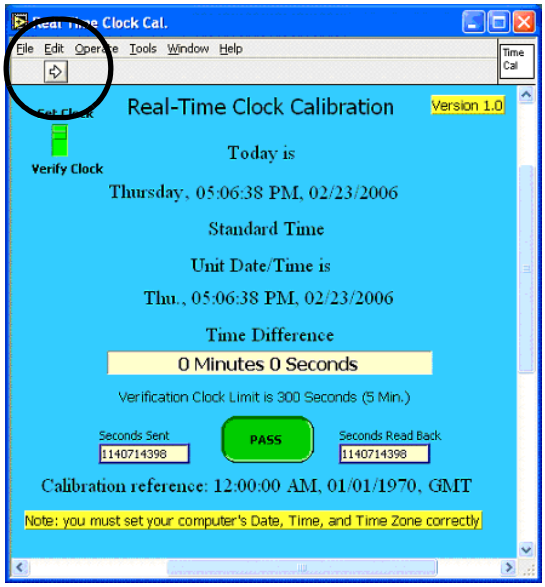


Figure 7-3: CALIBRATION COMPLETE

If Real-Time Clock Calibration Fails

If calibration fails, confirm that the BiPAP Focus Time and Date are set to within 5 minutes of the service PC. Re-run the calibration. If the calibration fails again, replace the controller PCB and retest.

MFTS Calibration

This procedure provides instructions for calibrating the BiPAP Focus from the Multi Function Test Station (MFTS). The results of this calibration can be printed and used as a final test data sheet that can be retained as part of the device history record.

NOTE: To preform a Field Calibration using a PC refer to “Field Calibration” on page 7-17.

Multi Function Test Station Set-up (MFTS)

Refer to Figure 7-4. Start the ventilator in Normal mode. While in S/T mode set the Respiratory Rate to **4 bpm**.

1. Ensure the computer and monitor are turned “ON”.
2. Ensure the MFTS is connected to a 110 VAC and 220VAC power source.

Figure 7-4: MFTS Setup

3. Ensure the MFTS is connected to a negative pressure source.

4. Remove the bacteria filter from the ventilator if it is connected.

5. Ensure that one end of the 6' Smooth-bor tubing is attached to the Druck DPI-260 O_2 port and the other end connected to the ventilator.

6. Ensure that the AC power cord is connected to the MFTS.

7. Ensure the MFTS has been running for a minimum of 1 hour before being using to calibrate units.

MFTS software setup

1. Double-click the MFTS icon located on the PC's desktop to load software.

2. Skip the Name and Password dialog box by clicking **OK**.

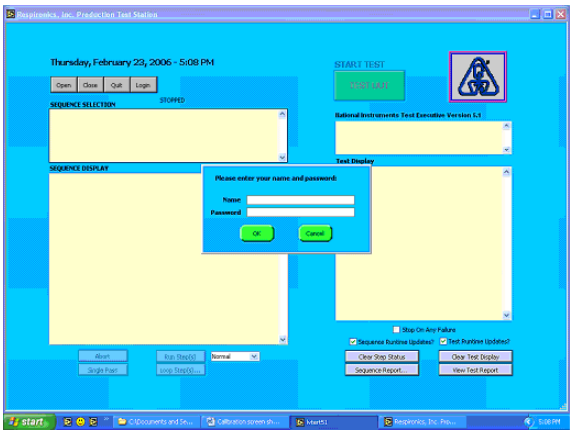


Figure 7-5: MFTS Name and Password

3. Click the **Open** button in the top left-hand corner.

4. Select file name **BiPAP Focus Production Post Test** and press the **Enter** key.

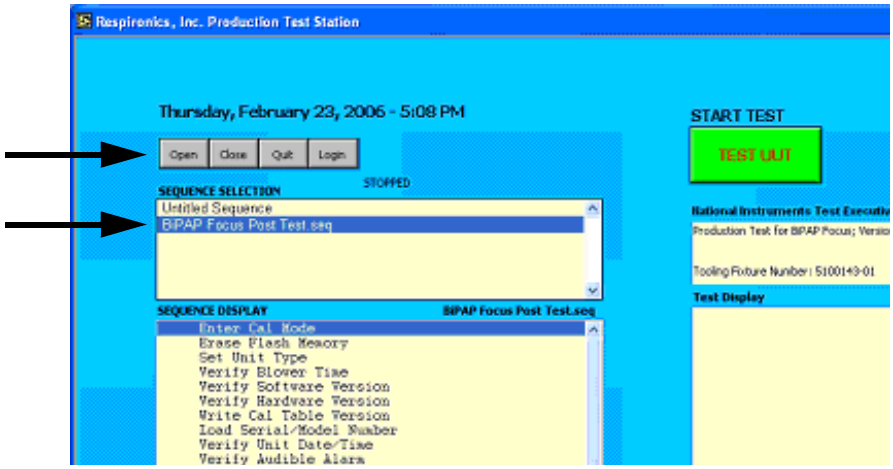


Figure 7-6: Selecting BiPAP Focus Post Test

5. The program will now download the test file.

Unit Under Test setup

1. Select a unit from the warm-up stand and ensure it has been running for a minimum of 30 minutes. Power of unit and move to the MFTS.
2. Connect the Druck DPI-260 O_2 to the outlet of the unit under test.
3. Connect the power and RS232 cables to the back of the unit.
4. Start the BiPAP Focus in diagnostic mode. Power on the unit and press the Standby key, then immediately press both the Alarm Silence and Alarm Reset keys simultaneously until the unit enters diagnostic mode then press **Continue**.

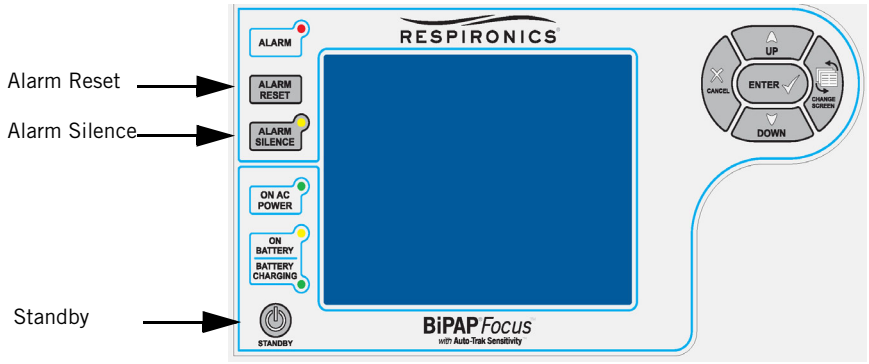


Figure 7-7: Entering BiPAP Focus Diagnostic Mode

Calibration

1. Click the green Test UUT box on the PC screen. Refer to Figure 7-5.

2. The software will now run a series of tests on the UUT. The person conducting the test will need to follow on-screen instructions throughout the testing process.

NOTE:	Retrieve and WRITE down the BLOWER SUBSYSTEM SERIAL NUMBER from the BiPAP Focus Product Information screen. It may be necessary to input the blower subsystem serial number if the memory is cleared because it failed calibration.

3. When prompted enter serial number of the sub-assembly and click **OK**.

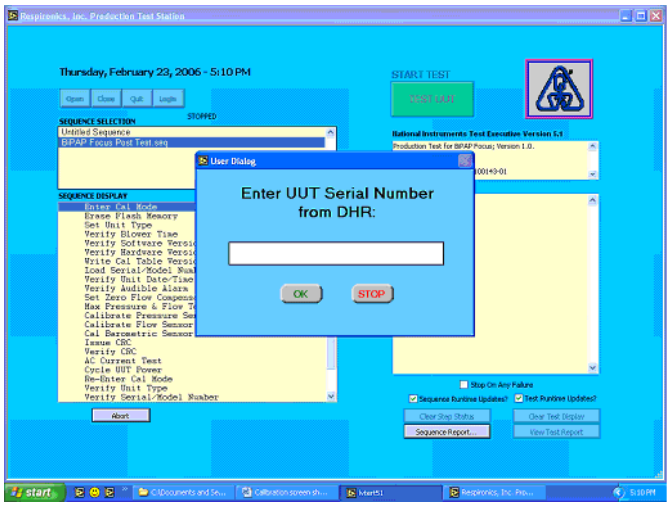


Figure 7-8: Entering Serial Number

4. When prompted enter the model number, enter **1026652** and click **OK**.

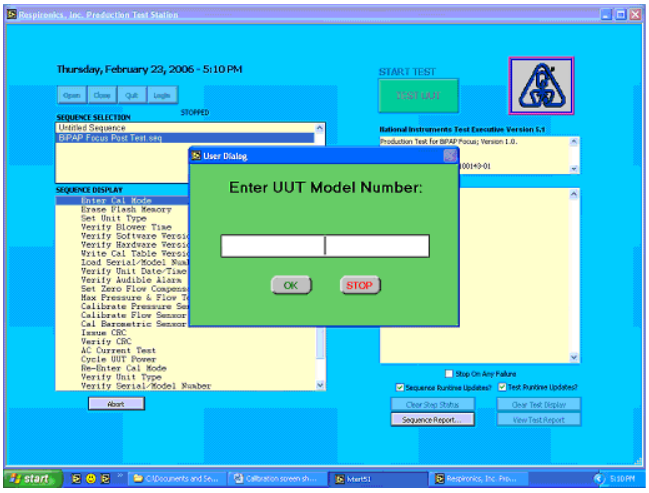


Figure 7-9: Entering the Model Number

5. When prompted enter "*Your Name*" and click **OK**.

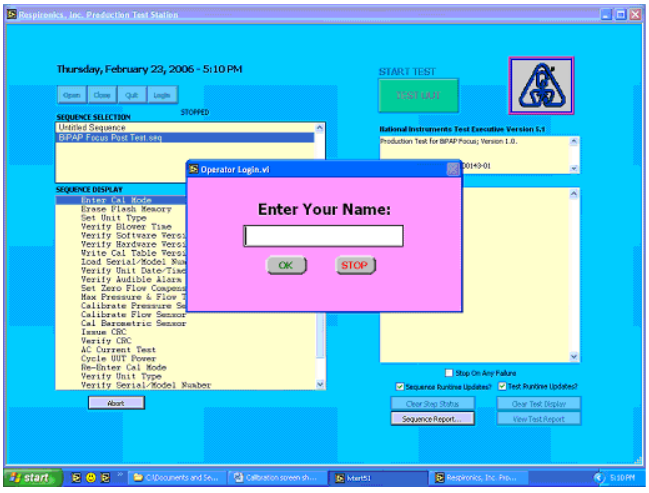


Figure 7-10: Entering Calibrator's Name

6. When asked to verify that the private label is Bi-PAP Focus check and click **PASS** if correct or **Fail** if incorrect.

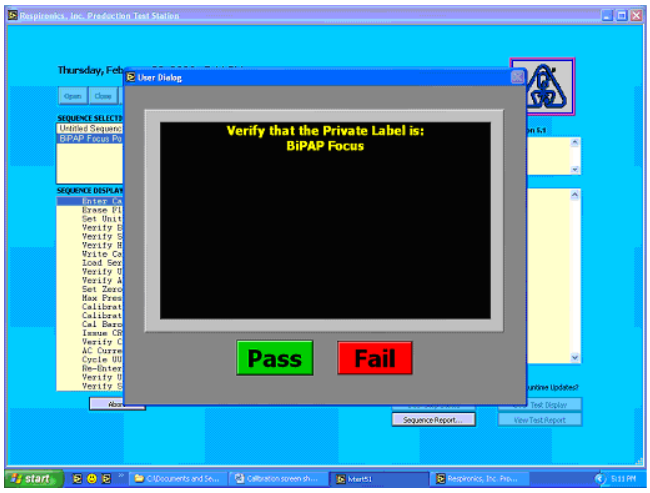


Figure 7-11: Verifying Private Label

7. When prompted to test the Audible Alarm, click **Yes**.

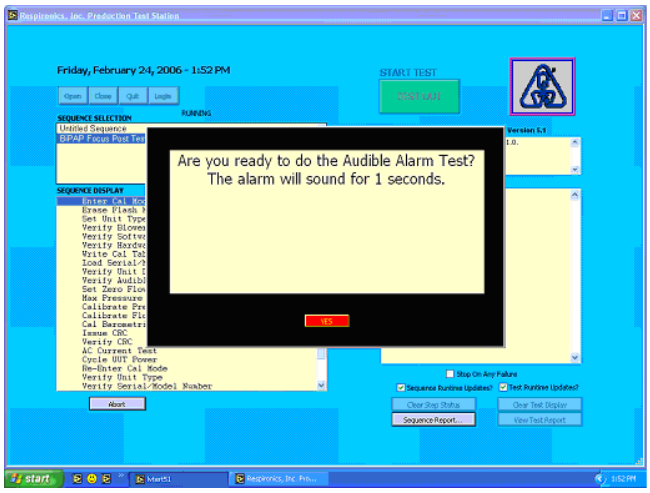


Figure 7-12: Audible Alarm Test

8. When prompted to verify if Audible Alarm sounded, click **PASS** if correct or **Fail** if incorrect.

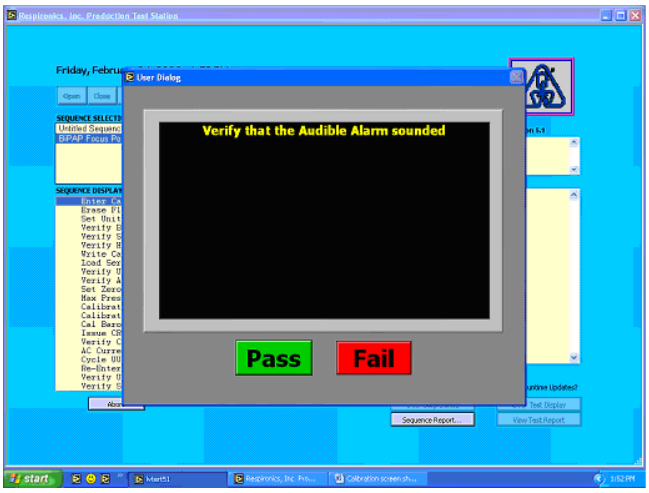


Figure 7-13: Audible Alarm Pass or Fail

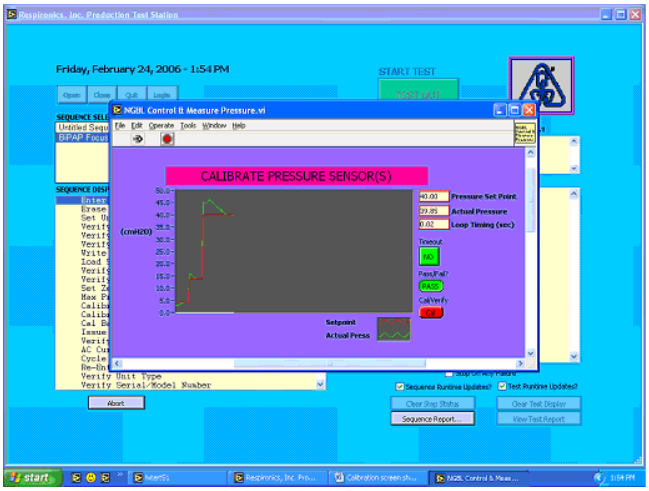


Figure 7-14: Calibrate Pressure Sensor(s)

9. When prompted to verify AC Current Test, power off the unit by pressing the Standby key on the front of the ventilator and switching the ON/OFF switch to the OFF position. Then restart the unit in diagnostic mode as per step ‘4.’ on page 7-10. When the unit powers back up click **OK** on the PC screen.

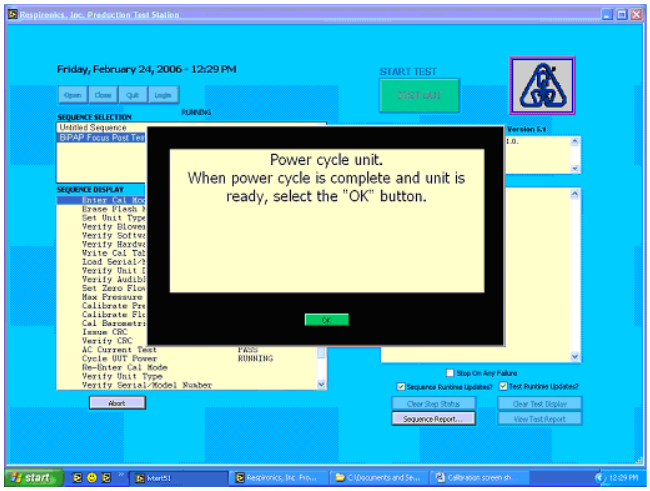

Friday, February 24, 2006 - 12:29 PM
START TEST
Power cycle unit.
When power cycle is complete and unit is ready, select the "OK" button.
OK

Figure 7-15: AC Current Test

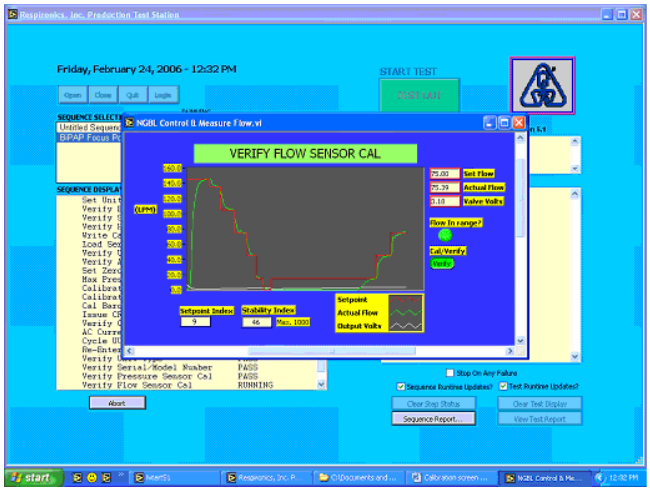


Figure 7-16: Verifying the Flow Sensor Calibration

10. The calibration of this device is finished when the Pass Test Banner appears. Click **OK** on the PC screen.

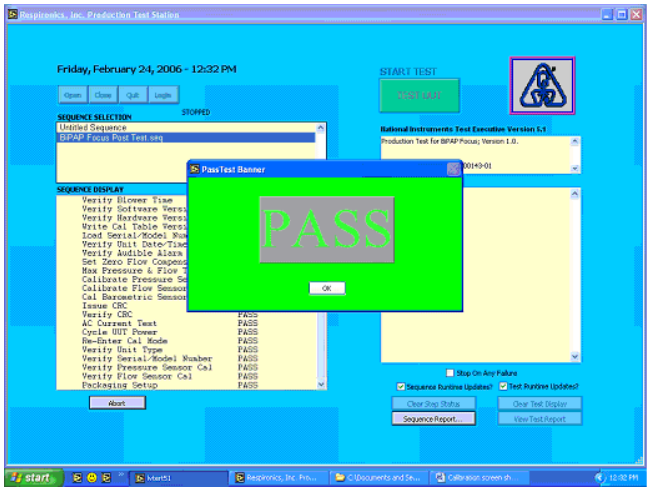


Figure 7-17: Pass Test Banner

11. Print a copy of the results, sign the sheet.

12. Power off the ventilator and remove the power cord and RS232 cable from the back of the device.

Field Calibration

This procedure provides remote instructions for the calibration of the BiPAP Focus. The results of this calibration can be printed to a local printer and used as a final test data sheet.

NOTE: Make sure real time clock calibration is complete before attempting the system calibration procedure. Refer to page 7-6.

Equipment Required

- Utility Software, Respironics Utility Tools (http://servicesoftware.respironics.com)
- Digital Manometer (Refer to Appendix A)
- Windows® - compatible personal computer running Windows XP version software.
- Printer
- BiPAP Focus Communications Cable Kit (P/N 1030010)
- Flow Meter (range: +180 to -180 lpm, 3% accuracy, 1 lpm resolution)
- Flow control valve (RI p/n 1006120)
- Pressure pick-off adapter (O_2 Enrichment Adapter (RI p/n 312710))
- Pressure Tubing
- Negative Flow Source (CPAP capable of 60 lpm)
- Smooth Bore Patient Tubing for intradevice connection

Recording Serial Numbers

It will be necessary to retrieve and write down the Serial Number of the ventilator, serial number of the Blower Subsystem and the Model Number.

NOTE: If the memory is cleared because it failed calibration it will be necessary to input the blower subsystem serial number.

1. Connect the female end of the serial communications cable to the service PC. Then connect the male end labeled Software/Rasp to the ventilator.
2. Power up the ventilator in diagnostic mode.
3. Use the Up\Down arrow keys to highlight **Product Information** from the menu.
4. Press the **Enter** key.

5. The Product Information screen will appear with the serial numbers of the System and Blower Subsystem. Write these down.

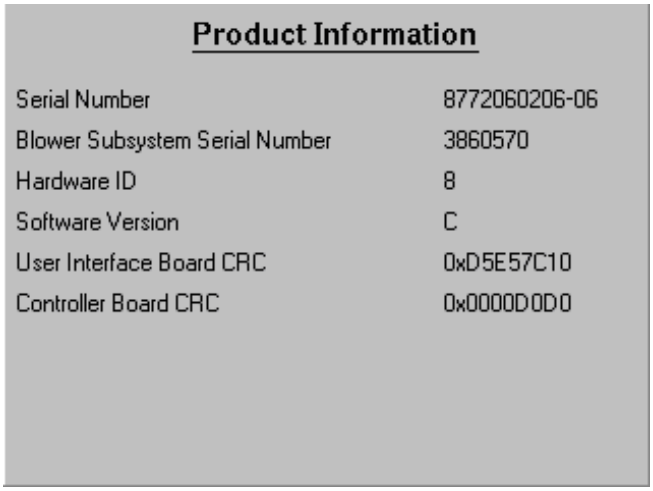


Figure 7-18: Product Information Screen

Next the model number can be obtained using the Service Center Tools Suite. Found at http://servicesoftware.respironics.com. If this tool already exists on the service PC go to step '5.' on page 7-18.

1. Go to the URL **http://servicesoftware.respironics.com** and click on **Respironics Utility Tools**.

2. Click the download button next to **Service Center Tools Suite**.

3. Download this utility to the service PC.

4. Extract the file **Service-Center-Tools.exe** and launch the installation wizard.

5. Navigate the start menu **Start \ Programs \ Respironics \ Tools \ Service Center Tools**.

6. Select Read Serial Number and Model Number from the drop down list 'Please Select A Tool To Execute...' click **Execute Tool**.

7. Write down the serial number and the model number for use later on during the calibration.

Procedure

Run the unit for a minimum of 35 minutes before beginning calibration. Start the ventilator in Normal mode. While in S/T mode set the Respiratory Rate to **4 bpm**.

1. Connect the female end of the serial communications cable to the service PC. Then connect the male end labeled Software/Rasp to the ventilator.

2. Connect the external power supply to the BiPAP Focus.

3. Remove the bacteria filter from the ventilator if it is connected.

4. Connect the oxygen enrichment adapter to the outlet of the BiPAP Focus and occlude the adapter.

5. Connect the pressure tubing from the O_2 port of the oxygen enrichment adapter to the digital manometer (refer to Figure 7-19 for setup).

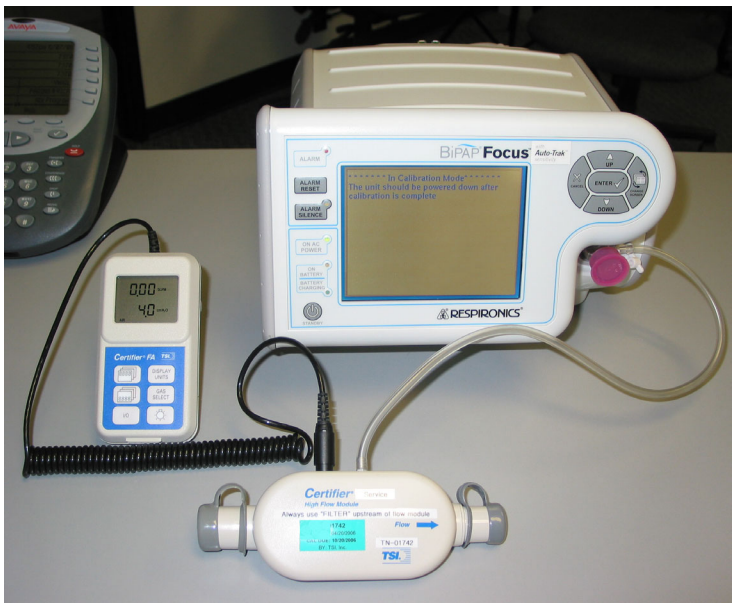


Figure 7-19: Pressure Setup

6. On the computer, open the Service Calibration Software.

7. Start the calibration by clicking on the white runtime arrow in the upper left hand corner of the window.

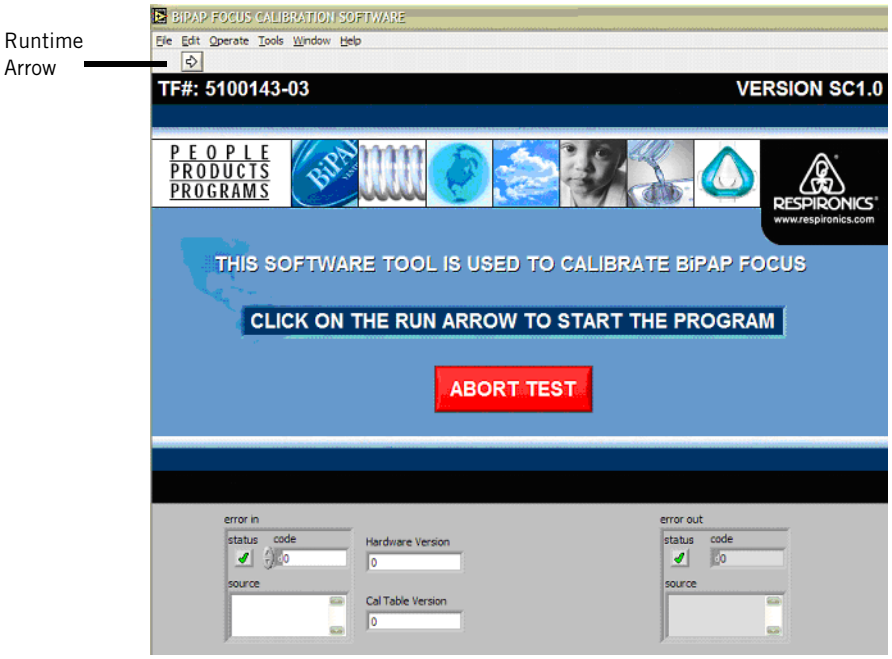


Figure 7-20: System Setup

8. The program will then prompt the user to enter the UUT SERIAL NUMBER of the from the ventilator display. (This is the Blower Subsystem Serial Number from the product information screen.) Click **OK** after entering the UUT Serial Number.

9. The program prompts to enter the UUT MODEL NUMBER. Click **OK** after entering the UUT Model Number.

10. Enter the OPERATOR NAME and click **OK**.

11. Verify that the label is: *BiPAP Focus*. Click **PASS**.

12. The program will then run through an alarm test. Follow the on screen instructions.

13. When the prompt in Figure 7-21 appears, the program is ready to start sensor calibration. Attach the manometer and occlude the test orifice then click **OK**.

Figure 7-21: System Calibration

14. Observe the manometer. If the pressure on the manometer is higher than 4.00 cmH_2O, click on the red **DECREASE BLOWER SPEED** button to decrease the blower speed. Decreasing the blower speed by MORE than the required amount and then using the green **INCREASE BLOWER SPEED** button to arrive at the exact amount is a preferred method.

    If the pressure on the manometer is lower than 4.00 cmH_2O, click on the green button to increase blower speed. Each time a button is clicked, the pressure will change by approximately 0.2 cmH_2O. When only 4.00 cmH_2O is achieved, click **DONE** on the screen.

NOTE:	Let the pressures stabilize for at least one minute before making any adjustments during the calibration.

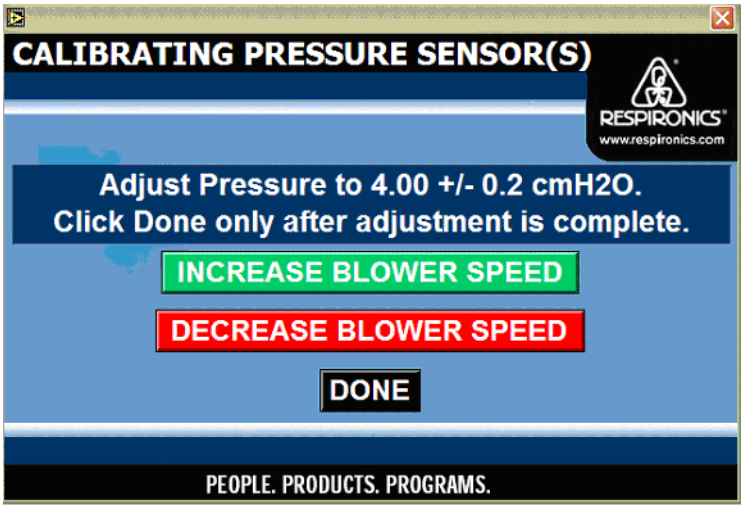


Figure 7-22: Increase/decrease Blower Speed

15. Type in the pressure reading from the manometer and press **ENTER** on the keyboard.

Figure 7-23: Entering Manometer Reading

16. The program will now request calibration at various pressure levels. Use the method suggested in step ‘14.’ on page 7-21 and follow the on-screen instructions.

17. After the last pressure calibration is performed, the following prompt will appear, indicating the program is about to start the flow element calibration. The program will first calibrate positive flow.

Figure 7-24: Flow Element Calibration

18. Press **ENTER** on the keyboard. Unblock the end of the oxygen enrichment adapter. Connect a section of patient tubing between the oxygen enrichment adapter and the inlet of the flow meter. Connect another section of patient tubing from the outlet of the flow meter to the control valve (completely open the flow valve).

19. Click the green **OK** button on the program window.

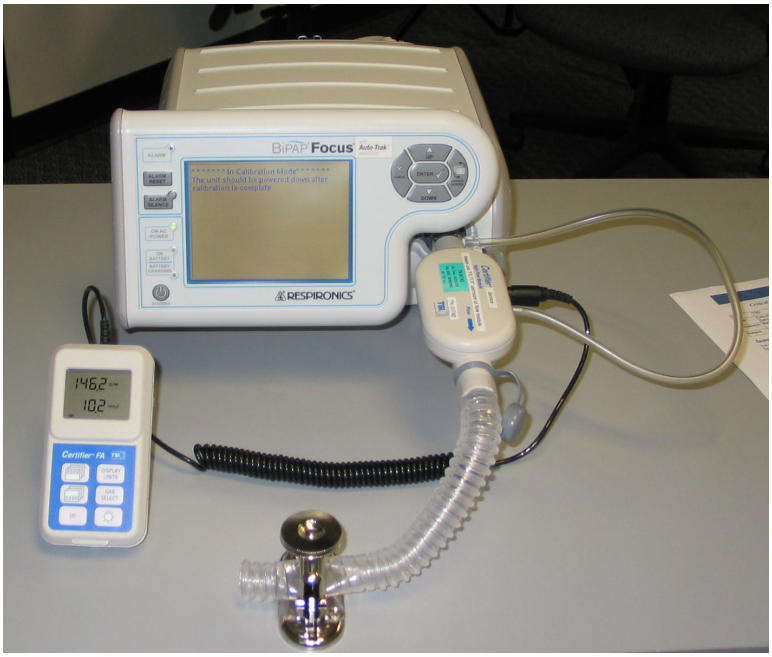


Figure 7-25: Calibration Circuit

20. Observe the flow meter. If the flow is greater than 160 lpm, click on the red button to decrease the flow. If the flow is less than 150 lpm, click on the green button to increase the flow. When the BiPAP Focus is delivering between 150-160 lpm, click on the **DONE** button.

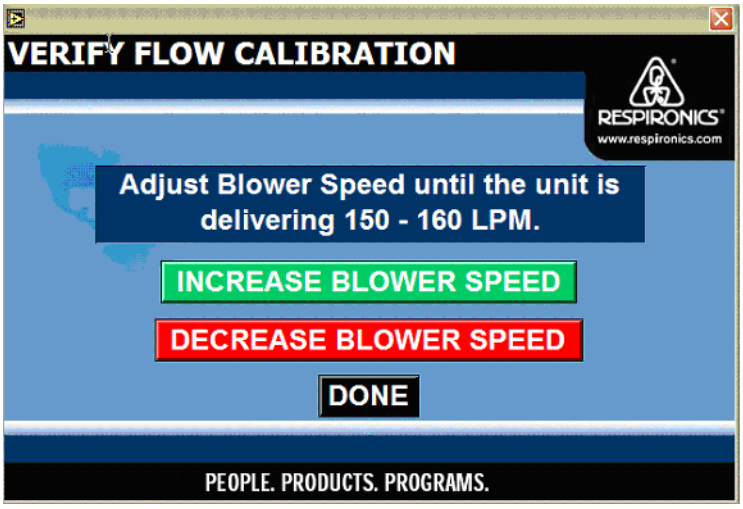


Figure 7-26: Increase/decrease Flow

21. Observe the flow meter and adjust the flow control valve until 146 lpm of flow is achieved. Once the desired value is achieved, click the green **OK** button.

22. The program will now request several different flow settings decreasing in value down to and including zero flow. For each setting, use the flow control valve to set the flow.

NOTE:	Always ensure that each setting is achieved before clicking OK on the screen that requested the setting.

After zero flow is confirmed, the screen prompt will appear *Connect and Apply Negative Flow Resource*. Refer to Figure 7-27.

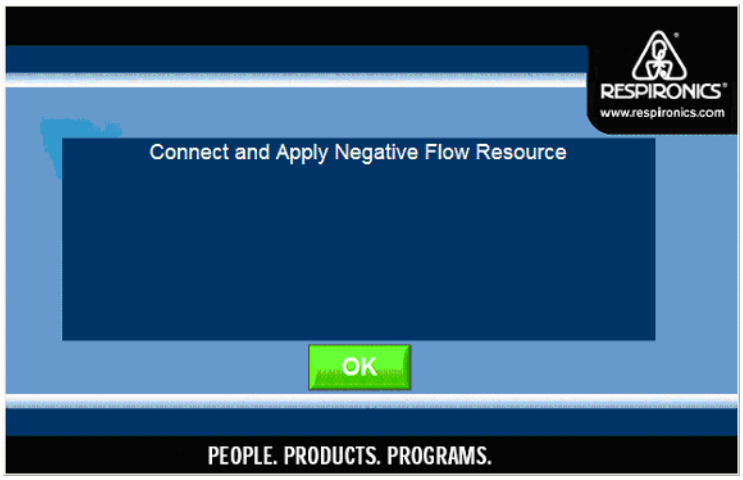


Figure 7-27: Zero Flow Confirmation

23. The program will now calibrate negative flow. Connect another section of patient tubing between the outlet of the flow control valve and the outlet of the negative flow source. Turn on the negative flow source and click on the green **OK** button.

NOTE:	For the negative flow source, a REMstar device may be used with the pressure set at 20 cmH_2O

Figure 7-28: System Calibration With Negative Flow Source

24. The program will now calibrate the negative portion of the flow table. Although the flow meter may not display a negative flow, pressure against the normal direction of flow of the device is considered a

negative flow. Adjust the flow control valve until 10 lpm is displayed on the flow meter. Only then, click **OK**.

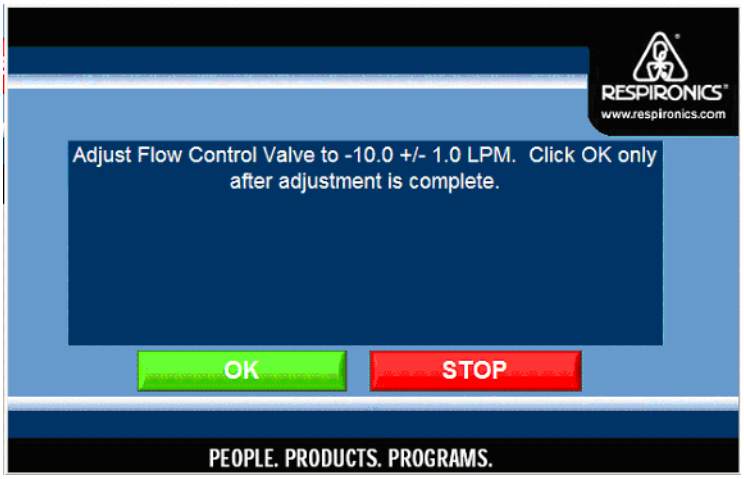


Figure 7-29: Negative Flow Value Display

25. Enter the flow value. Be sure to enter the negative or minus symbol first. The software will reject a positive value here.

Figure 7-30: Entering The Negative Flow Value

26. Once again, use the flow control valve to set the negative flows that the program requests. Once these values are set then click **OK**.

27. On the next screen prompt, type the value observed on the TSI then click **OK**.

28. The program now requests “Remove Negative Flow Resource”. Remove the resource and click **OK**.

29. The program has now completed calibrating the flow and pressure sensor. Pressure and flow accuracy of the device must now be verified. The program will now read the pressure and flow parameters from the device and compare these reading to the pressure and flow values that the user will enter. When prompted to power cycle the unit, make sure to re-enter Diagnostic mode during power up.

30. The program will first verify positive flows. Completely open the flow valve. Follow the prompts on the screen for the various flow settings. When prompted to set a flow, click **OK** only after the flow has been set.

31. After zero flow is confirmed, the program will verify negative flow. Connect the patient tubing between the outlet of the flow valve and the negative flow source. Turn on the negative flow source and follow the prompts. When prompted to set a flow, click **OK** only after the flow has been set.

32. After completion of the negative flow verification, pressure accuracy will be checked. Turn off the negative flow source. Disconnect the patient tubing and occlude the O_2 port at the BiPAP Focus outlet port. The program will now command the ventilator to produce the specific pressures. Observe the manometer and enter the value for each pressure setting.

NOTE: Pressure accuracy of both the blower and the valve is checked; therefore, step 32. is performed twice.

33. A green **PASS** prompt will appear on the computer screen. Click the **OK** button to view the test data sheet. Click **OK** on the print results button to print the test data sheet.

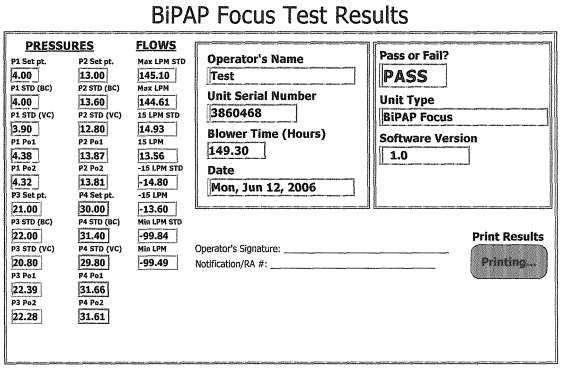


Figure 7-31: BiPAP Focus Test Results print out

Performance Verification

This procedure provides guidelines to verify the performance of the BiPAP Focus.

Procedure

1. Record the Serial Number of the unit located on the bottom enclosure.
2. Plug the BiPAP Focus power source in and record the line voltage used for testing and the blower hours on the test data sheet.
3. Place the BiPAP test orifice (RI p/n 332353) on the outlet of the unit. Connect a Digital Manometer to the test orifice.
    a. Enter the Normal mode of the BiPAP Focus.
    b. Set the BiPAP Focus to the CPAP mode and the pressure to 4 cmH_2O. Verify the pressure reading and record it on the test data sheet.
    c. Set the BiPAP Focus to 20 cmH_2O. Verify the pressure reading and record it on the test data sheet.
    d. Set the BiPAP Focus to the S/T mode and set the IPAP pressure to 10 cmH_2O, EPAP pressure to 5 cmH_2O, BPM to 10 and the Ti I-time to 2.0.
    e. Verify that the BiPAP Focus is switching between IPAP and EPAP mode and record the results on the test data sheet.
    f. While still in the Normal mode, activate the ramp time setting.
    g. Enable ramp time to 5 minutes.
    h. Observe the display and the manometer reading verify the pressure increases to the target pressure in 5 minutes. Record results on test data sheet.

Performance Verification Data Form

Complete this form at every performance verification. Make copies of this form for data collection.

Internal Use Only

Date:	Notification Number(s):

Preliminary Ventilator Cleaning and Inspection

	Select One	
Was the ventilator exterior damaged?	YES	NO
If yes, provide a brief description of damage and repair:		
Replaced damaged parts as needed.	YES	NO
Cleaned the ventilator exterior	YES	NO
Cleaned the ventilator interior using an ESD-safe vacuum	YES	NO
Inspected inlet filters	YES	NO

Serial number:	
Blower Subsystem Serial number:	
Software version:	

Test 1: Electrical safety	Passed Value
Ground resistance: (<0.2 ohm)	Ω
Forward leakage current: (<100 uA when connected to 100-120V) (<300 uA when connected to 220-240V)	µA
Reverse leakage current: (<100 uA when connected to 100-120V) (<300 uA when connected to 220-240V)	µA

Test 2: Alarm / LED	Circle One	
On AC Power LED	PASS	FAIL
Battery Charging LED	PASS	FAIL
Primary Audible Alarm	PASS	FAIL
Bkup Audible Alarm	PASS	FAIL
Remote Alarm	PASS	FAIL
Alarm LED	PASS	FAIL
Silence LED	PASS	FAIL
On Battery LED	PASS	FAIL

Technician's Signature **Date**

Chapter 8. Component Removal/Installation

This chapter illustrates the names and locations of the replaceable components in the BiPAP Focus system. This chapter provides a quick reference and overview of the unit. Within each replacement section, more detailed support information is provided to illustrate the exact component location and replacement procedure(s).

WARNING:	**To avoid personal injury, always disconnect external AC and DC power sources from the ventilator before servicing or cleaning.**
CAUTION:	Electronic components used in this device are subject to damage from static electricity. Repairs made to this device must be performed only in an antistatic, Electro-static Discharge (ESD)-protected environment.
CAUTION:	Removing the UI board will eliminate the serial number, significant event log entries as well as ventilator preferences. Review the significant event log before removing the UI board.
NOTE:	When reconnecting the tubing to the sensors or Controller PCB always clip the end of the tubing leaving only 2mm of the flanged tubing. This will promote a tight fit with the newly clipped tubing

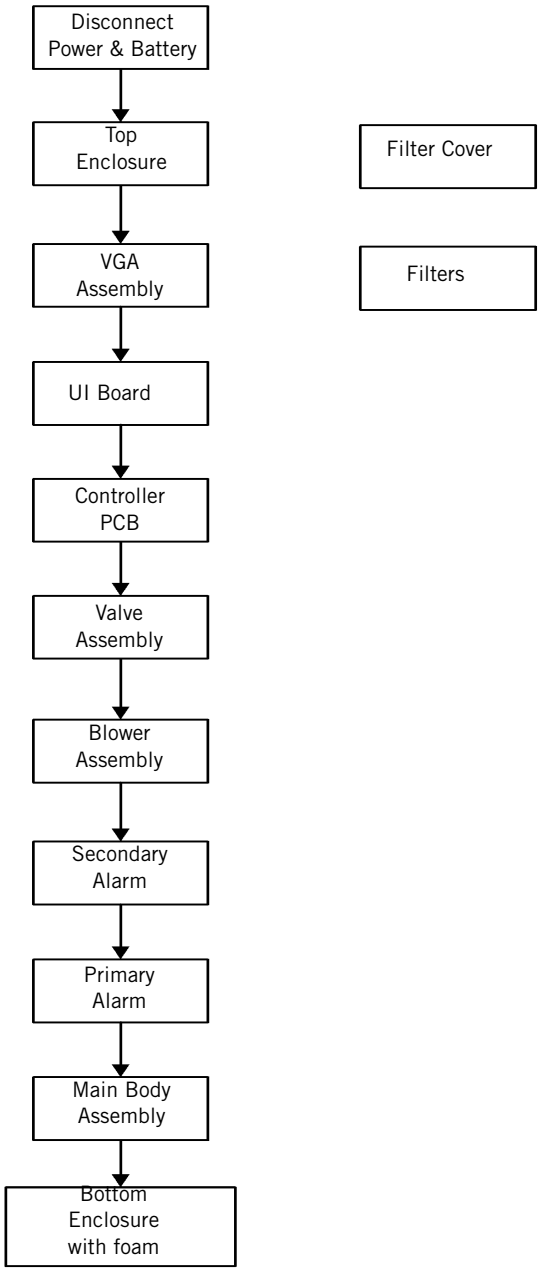


Figure 8-1: Disassembly Flowchart

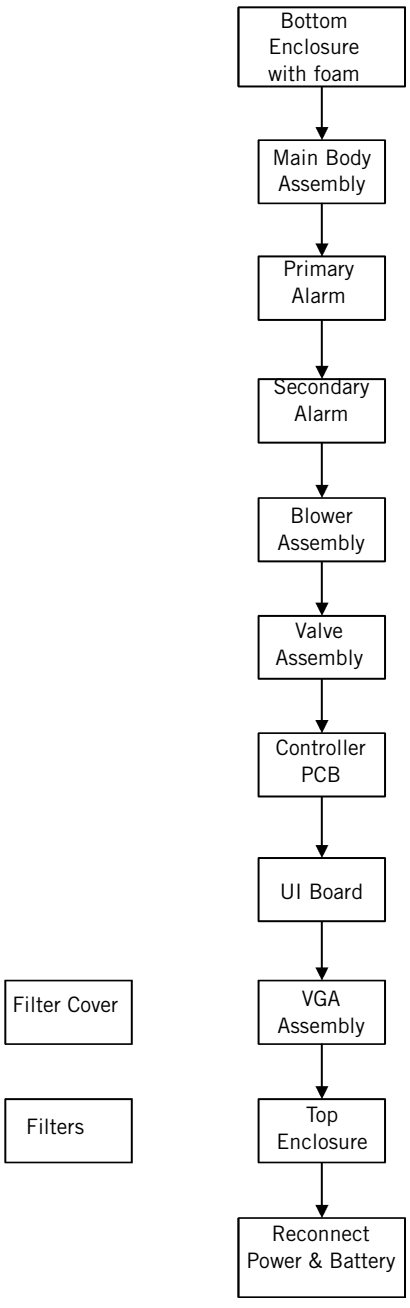


Figure 8-2: Assembly Flowchart

Disconnecting Power

Before removing any components disconnect both power sources from the machine. Refer to Figure 8-3.

1. Turn the ON/OFF switch to the OFF position (O) and disconnect the power cord
2. Turn the unit over and remove the two (2) battery access cover screws. (Install with 5 in/lb. of torque)
3. Remove the battery cover and battery pack.
4. Disconnect the battery

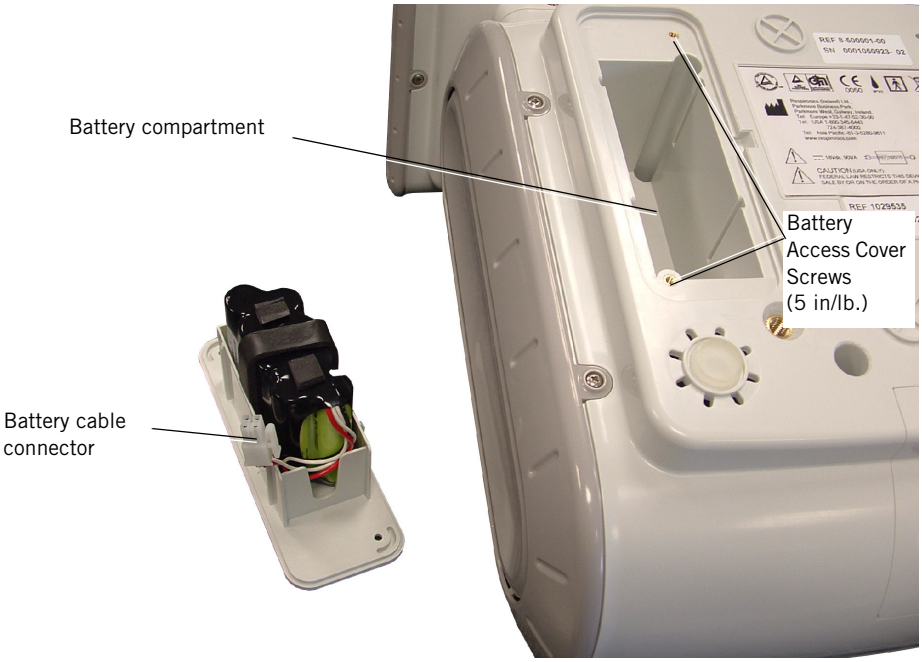


Figure 8-3: Disconnecting Battery Power

Top Enclosure

Follow these steps to remove the top cover (Figure 8-4, Figure 8-5 ,Figure 8-6). Reverse to install.

1. Place the ventilator on a protected work surface and carefully turn it over, exposing the bottom.
2. Remove the screws that hold the side panels to the ventilator and remove the side panels. (Install with 5 in/lb. of torque)
3. Remove the four screws that hold the VGA assembly to the ventilator. (Install with 8 in/lb. of torque)

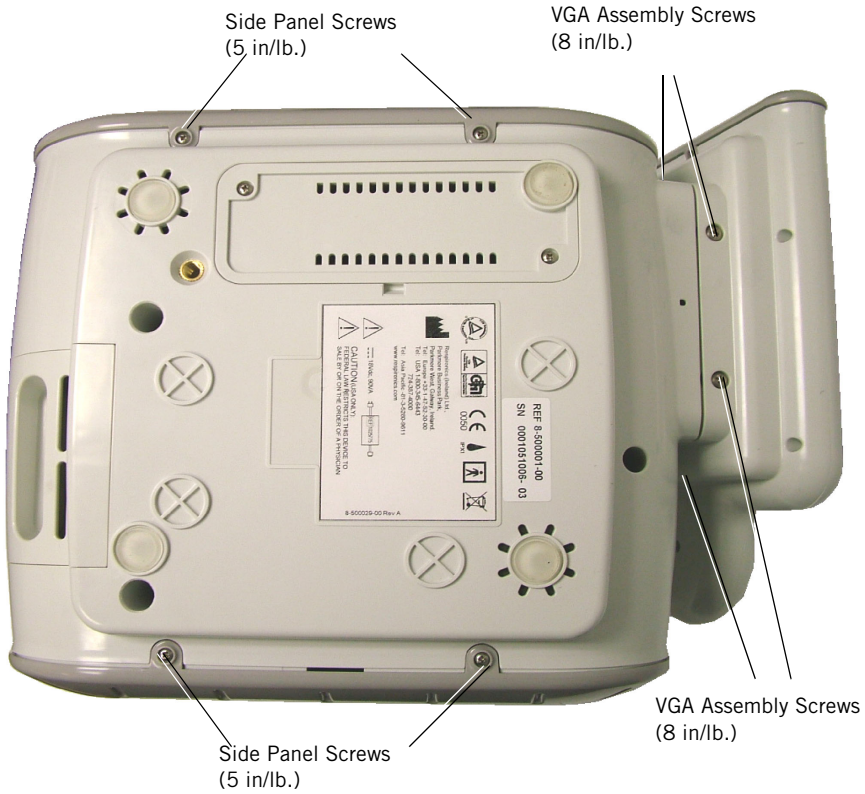


Figure 8-4: Bottom enclosure

Figure 8-5: Remove side panels

4. Carefully turn it over placing the ventilator on its feet.

5. Using a 5mm nut driver remove the JACK SCREWS from the 9-pin serial port on rear. These impede the removal of the top enclosure.

6. Remove the ON/OFF switch bezel before reattaching the top enclosure. Gently apply downward pressure to the top of the bezel allowing it to spring outward. Then, gently apply upward pressure to the bottom of the bezel allowing it to spring outward

Figure 8-6: Bipap Focus back panel

7. Tilt the bottom of the VGA assembly outward until the assembly is separated from the bottom and top enclosures.

8. Remove the four screws holding the top and bottom enclosure together. (Install with 5 in/lb. of torque)

9. Remove top enclosure. Lift front edge of top enclosure. Serial port and ON/OFF switch cut outs on rear side must clear port and switch.

VGA Assembly

Follow these steps to remove or replace the front or rear VGA panels, interface board, VGA screen or cables (Figure 8-7, Figure 8-9, Figure 8-10, Figure 8-10).

1. Remove top enclosure (“Top Enclosure” on page 8-4).

2. Disconnect the Parlex cable from the UI board.

3. Disconnect the ground strap clip from the UI board.

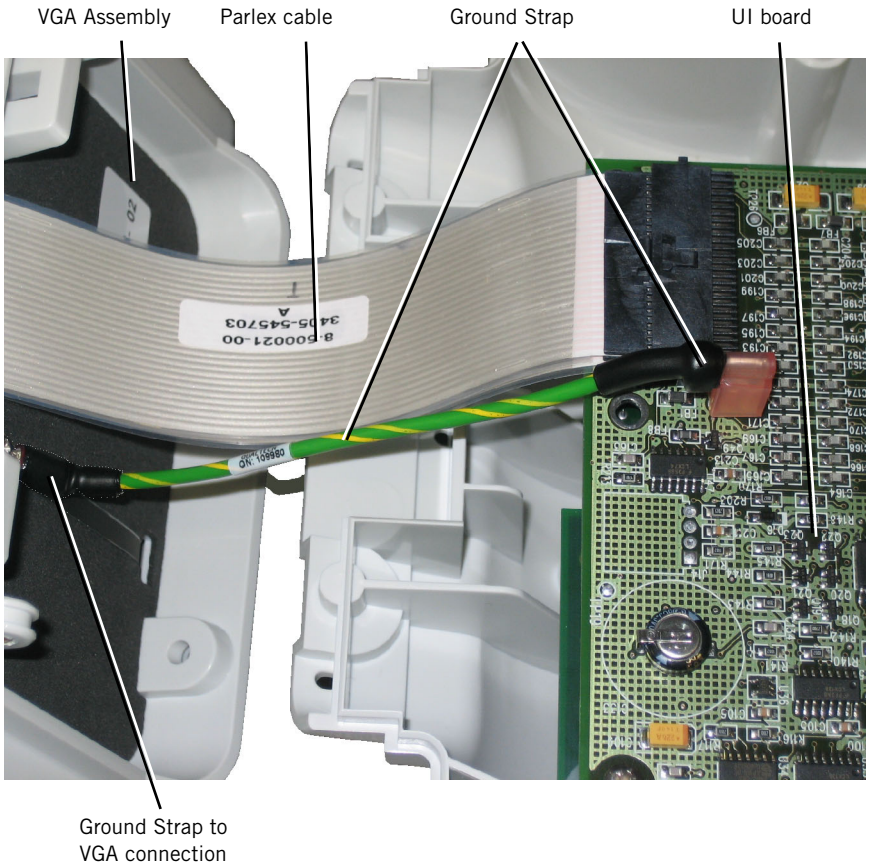


Figure 8-7: VGA Assembly cables attached to UI board

4. Place the VGA assembly face down on protected work surface.

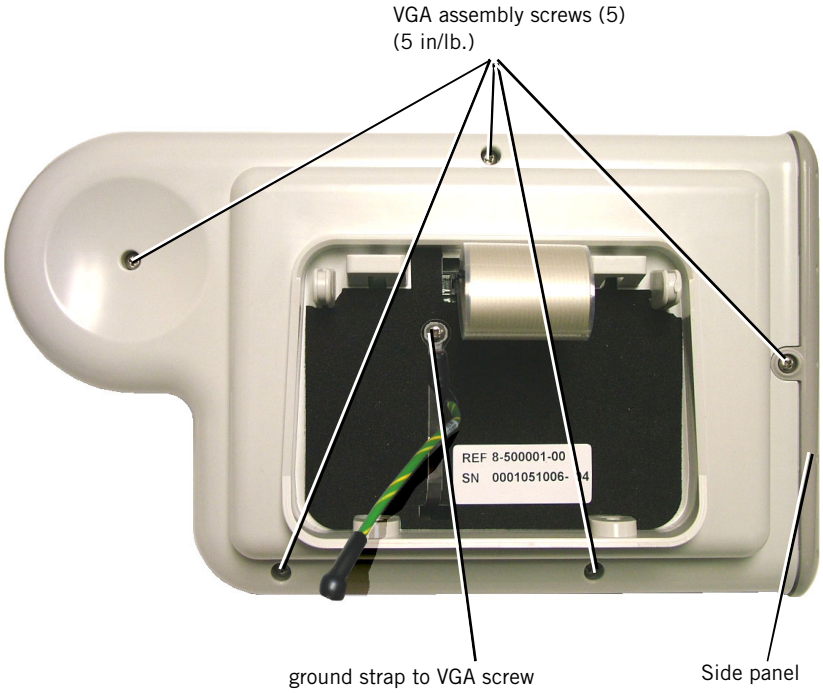


Figure 8-8: VGA assembly and ground strap connection

5. Remove the ground strap to VGA screw on the VGA assembly
6. Remove the five screws from back side of assembly. (Install with 5 in/lb. of torque)
7. Remove the side panel.
8. Carefully turn the VGA assembly over laying it on its back panel.
9. Carefully open the assembly. Do not damage the ribbon cable and ground strap between the VGA screen and the interface board.
10. Pull the ground strap through and out the back VGA panel to open the assembly completely.
11. Remove the four screws that secure the VGA screen and interface board. (Install with 5 in/lb. of torque)
12. Disconnect the cables from the interface board.

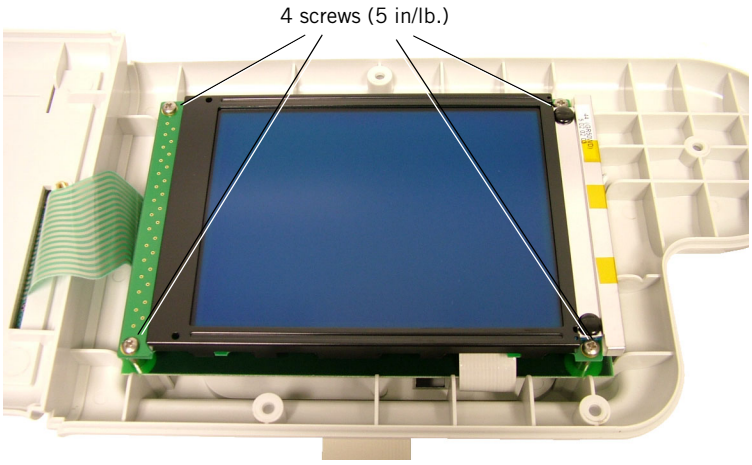


Figure 8-9: VGA screen secured to back panel of VGA assembly

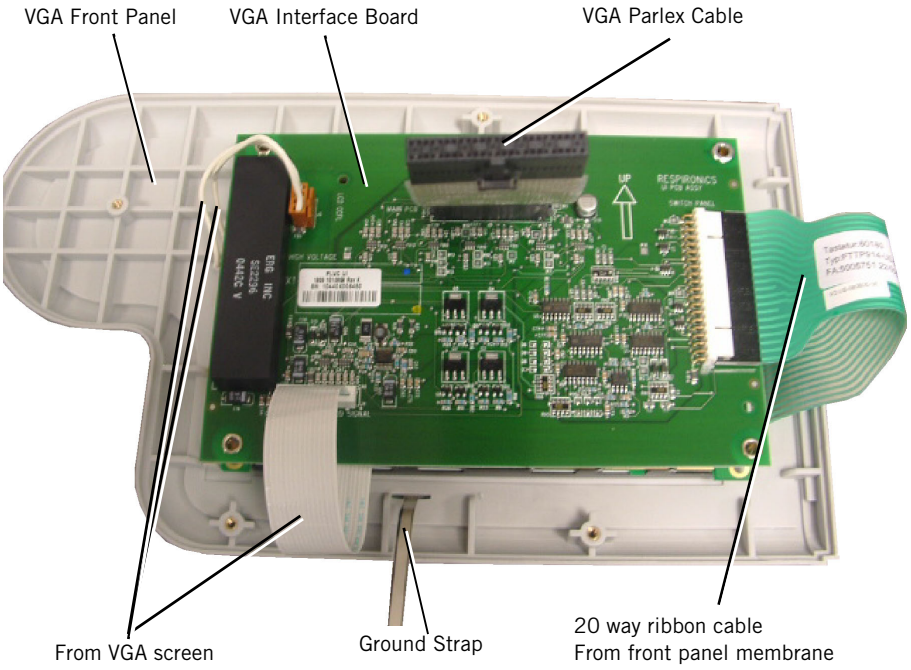


Figure 8-10: VGA interface resting on keypad assembly panel of VGA assembly

13. Replace the keypad assembly panel, back panels, interface board, VGA screen or cables as necessary and reverse these instructions to install.

NOTE:	Tuck ribbon cables under interface board before securing screws. Do not twist or pinch cables between panels.

User Interface Board

Follow these steps to remove the User Interface Board (Figure 8-11). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).

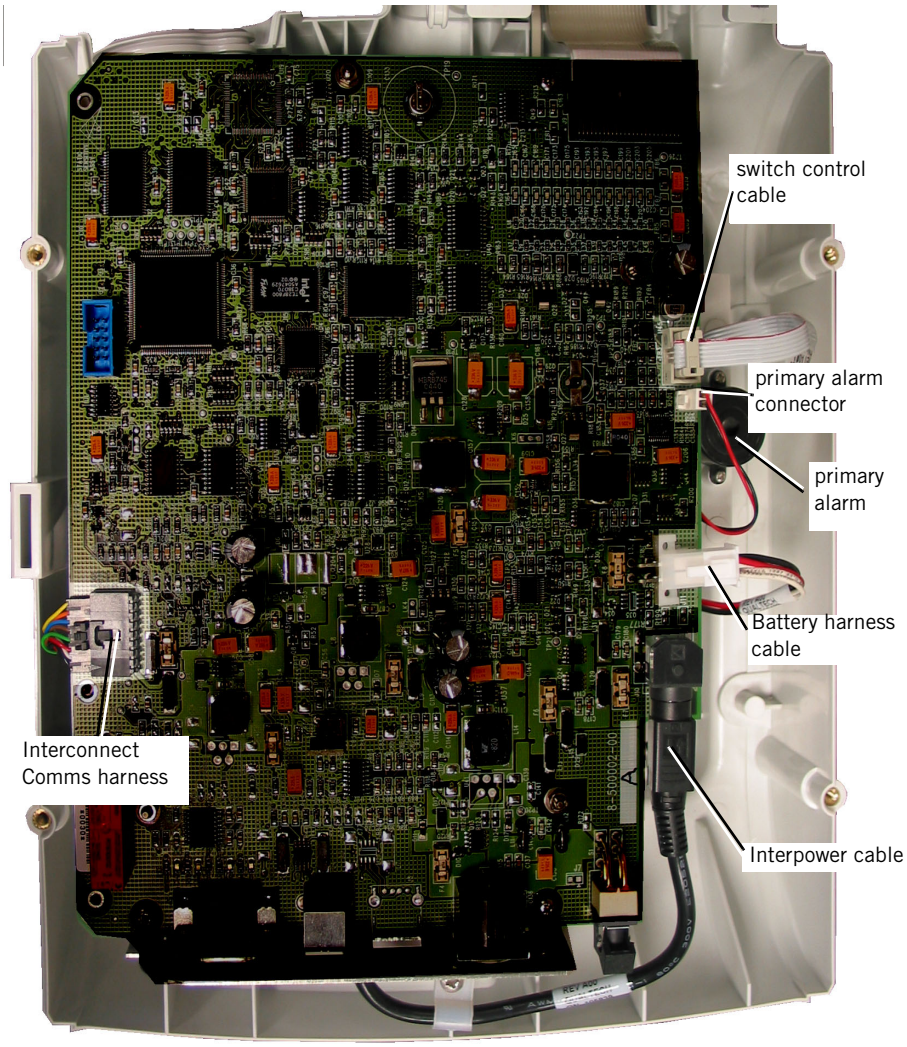


Figure 8-11: User Interface Board

2. Disconnect the cable connections:
   - 6-pin switch control cable
   - 2-pin primary alarm connector
   - Battery cable harness from battery housing
   - Interpower cable from Controller PCB
   - 8-pin interconnect comms harness

3. Remove the interconnect comms harness clamp screw.

4. Using a #2 phillips screwdriver, remove the 4 nuts from the pillar supports.

Controller PCB

Follow these steps to remove the Controller PCB (Figure 8-12). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).

2. Remove the user interface board (“User Interface Board” on page 8-10).

3. Disconnect the interpower cable.

4. Using a #2 phillips screwdriver remove the three stand off nuts.

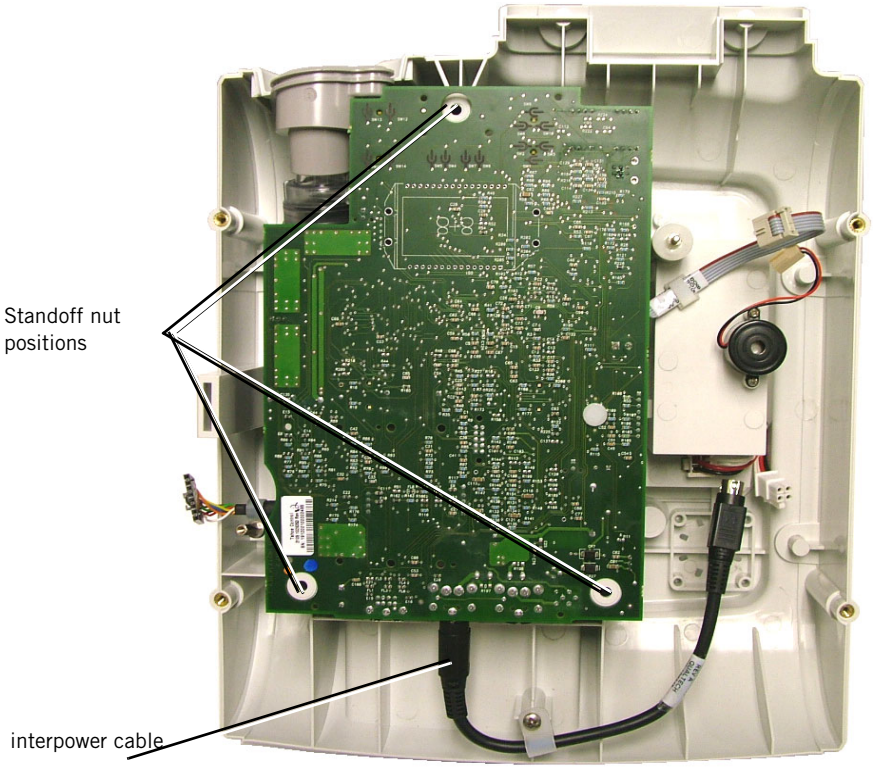


Figure 8-12: Controller PCB

5. Lift the board to expose the remaining harnesses cables and tubing.

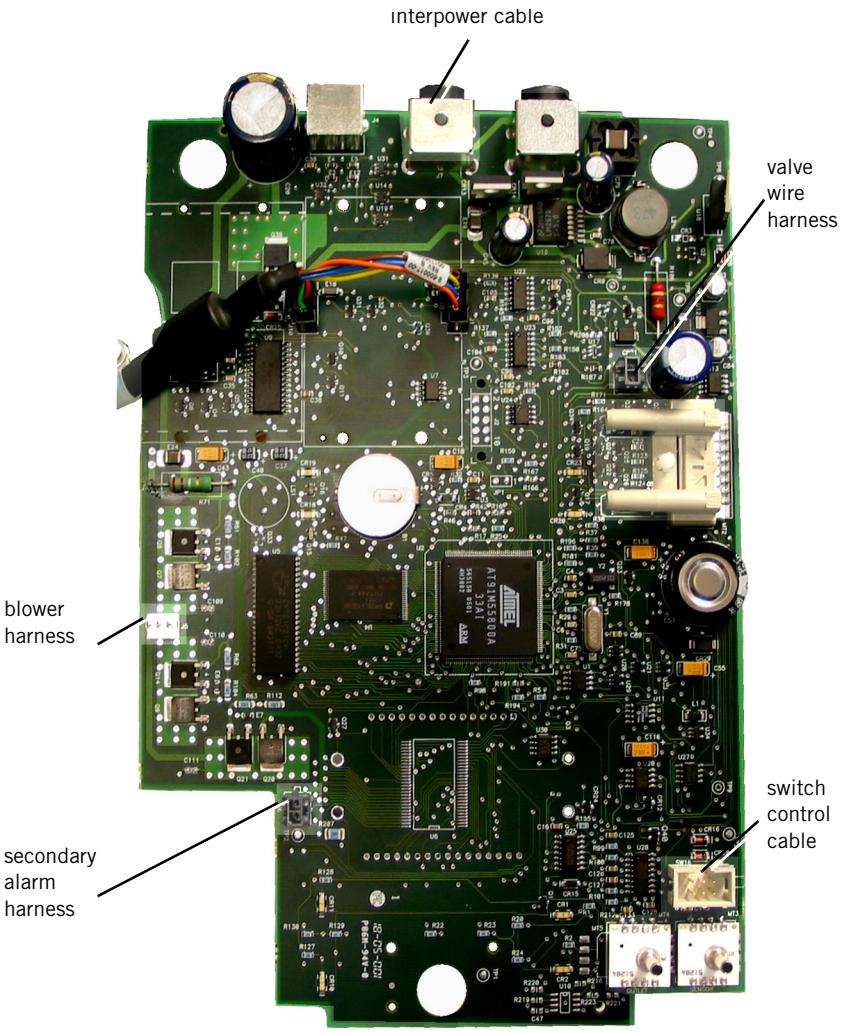


Figure 8-13: Controller PCB connection points

6. Disconnect the 6-pin switch control cable.
7. Disconnect the 2-pin valve wire harness.
8. Disconnect the 3-pin blower harness.
9. Disconnect the 2-pin secondary alarm harness.
10. Disconnect the tubing from the pressure transducers. Label them for proper reassembly.

NOTE:	When reconnecting the tubing to the sensors or Controller PCB always clip the end of the tubing leaving only 2mm of the flanged tubing. This will promote a tight fit with the newly clipped tubing

11. If necessary, disconnect the 8-pin interconnect comms harness.

Valve Assembly

Follow these steps to remove the valve assembly (Figure 8-14). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).
2. Remove the user interface board (“User Interface Board” on page 8-10).
3. Remove the user Controller PCB (“Controller PCB” on page 8-11).

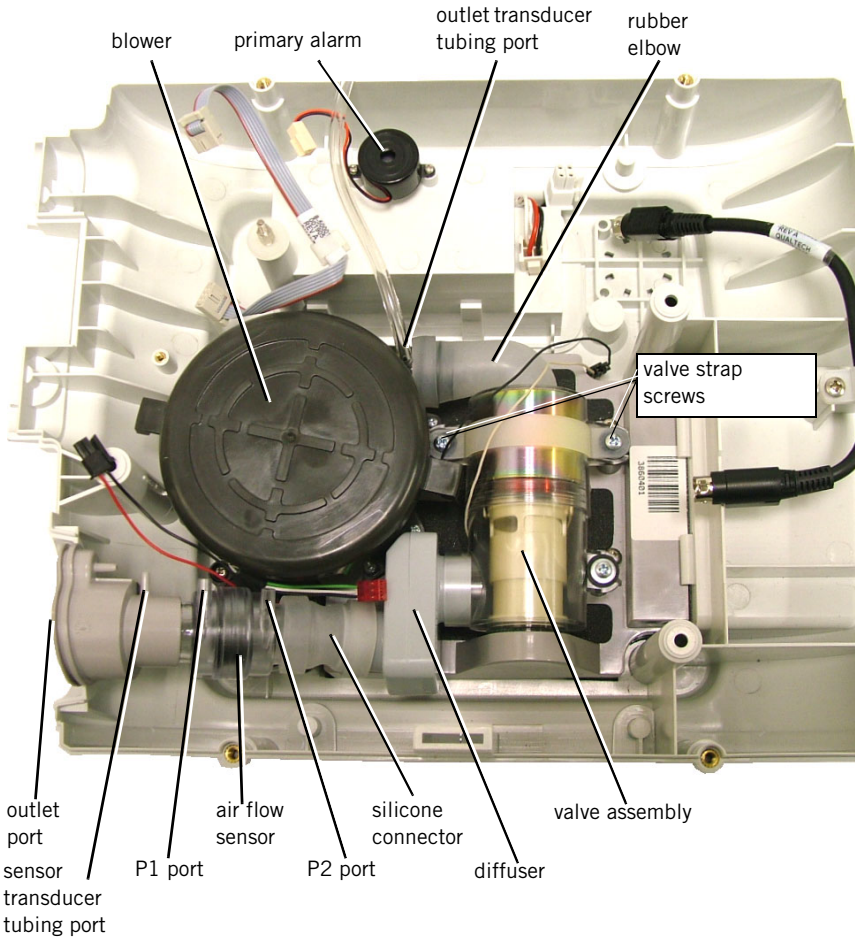


Figure 8-14: Valve Assembly and base layer components

4. Disconnect the rubber elbow from the blower outlet.

CAUTION:	Do not pull the rubber elbow away from the valve assembly. Separating the two results in replacing the entire valve assembly.

5. Disconnect the fixed orifice pressure sensor assembly.
6. Remove the three screws and valve strap from the valve assembly. (Install with 6in/lb. of torque). Do not lose the three rubber grommets.
7. Remove or replace the valve assembly.

Blower

Follow these steps to remove the Blower (Figure 8-14, Figure 8-15). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).
2. Remove the user interface board (“User Interface Board” on page 8-10).
3. Remove the user Controller PCB (“Controller PCB” on page 8-11).

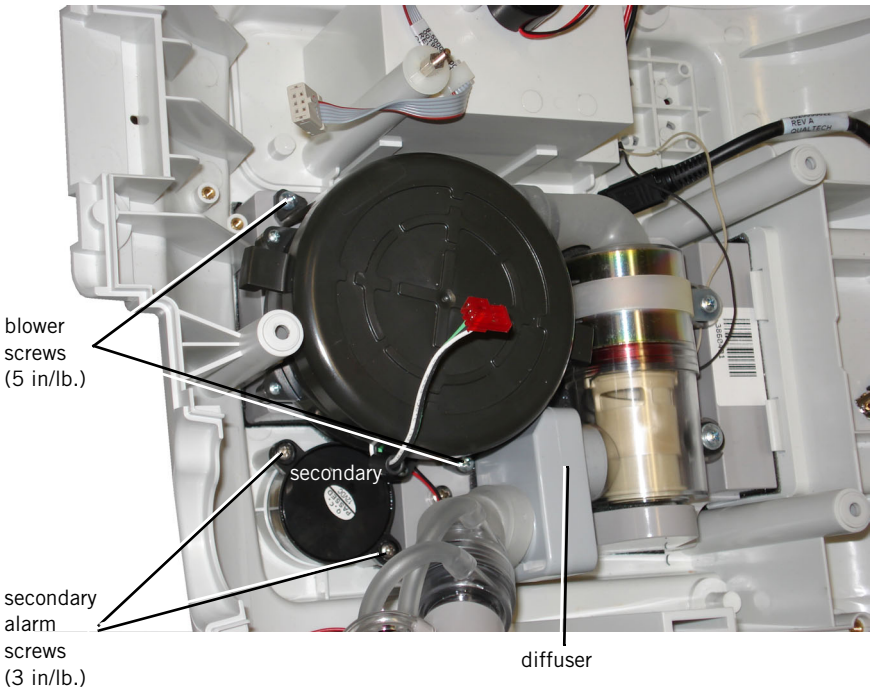


Figure 8-15: Blower and Secondary Alarm

4. Remove the two screws from both sides of the blower that anchor the blower to the main body plate.

NOTE: When replacing the blower and gummy align the tabs on the Blower Assembly with the cut-outs in the main body plate and place the blower assembly into the gummy in the main body assembly, ensuring a snug fit is present. Refer to Figure 8-16.

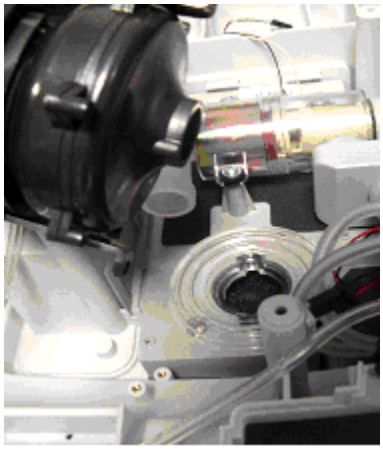


Figure 8-16: Aligning blower tabs

5. Pull the blower from the gummy. Discard the gummy.

Secondary Alarm

Follow these steps to remove the secondary alarm (Figure 8-14, Figure 8-15). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).
2. Remove the user interface board (“User Interface Board” on page 8-10).
3. Remove the user Controller PCB (“Controller PCB” on page 8-11).
4. Do not disconnect the outlet port and flow sensor assembly from the diffuser. Move them out of the way. Refer to Figure 8-14.
5. Remove the two screws from both sides of the secondary alarm. (Install with 3 in/lb. of torque).
6. Remove the secondary alarm and foam.

Primary Alarm

Follow these steps to remove the primary alarm (Figure 8-17). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).

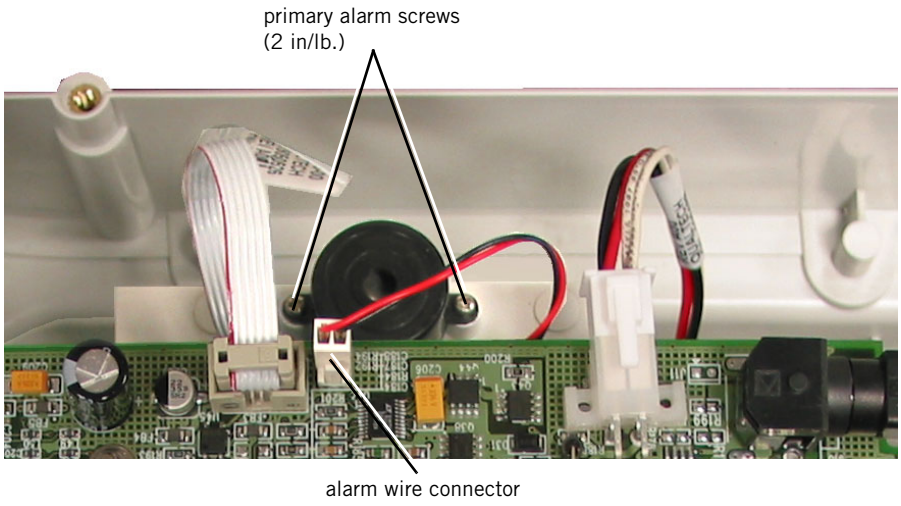


Figure 8-17: Primary Alarm

2. Disconnect the 2-pin alarm wire connector from the user interface board.

3. Remove the two screws from both sides of the primary alarm enunciator that anchor the alarm to the battery housing. (Install with 2 in/lb. of torque).

Main Body Assembly

Follow these steps to remove the main body assembly (Figure 8-15). Reverse to install.

1. Remove top enclosure (“Top Enclosure” on page 8-4).

2. Remove the user interface board (“User Interface Board” on page 8-10).

3. Remove the user Controller PCB (“Controller PCB” on page 8-11).

4. Remove blower (“Blower” on page 8-14).

5. Remove the four screws from the main body assembly that anchor the assembly to the bottom enclosure. (Install with 8in/lb. of torque).

6. Pull really hard to get the foam adhesive loose.

Interconnect Diagrams

This section shows the power (Figure 8-18) and communication (Figure 8-19) interconnections.

NOTE:	To promote conductivity between connectors, ensure that Nyogel 7606 lubricant is applied to all connections except gold-gold cable connections.

The Power to the TCB and the UI are described as follows.

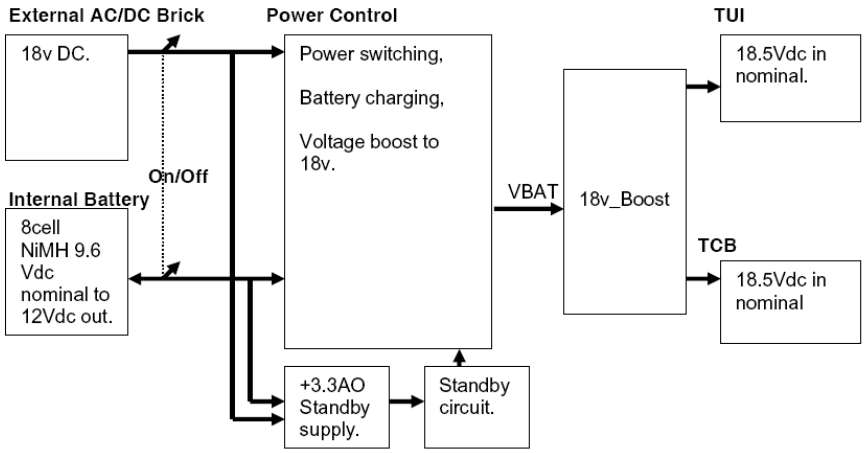


Figure 8-18: Power Interconnection

BiPAP Focus has the following communications requirements:

- IPC between the TCB and the UI.
- Serial port for calibration and TCB software upgrade
- USB port for UI section software upgrade

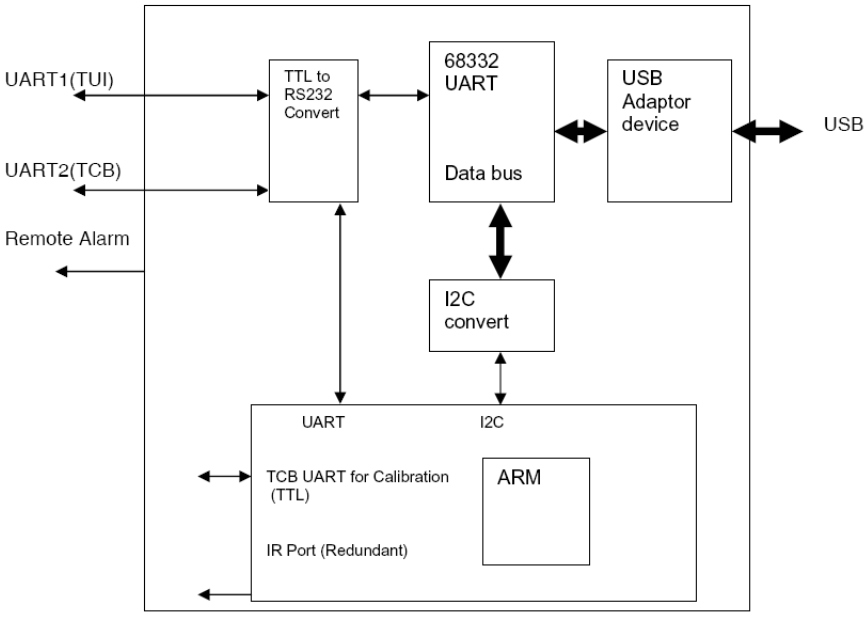


Figure 8-19: Communications Interconnection

Chapter 9. BiPAP Focus Replacement Parts List

This section lists and illustrates the major components of the BiPAP Focus portable ventilator, including:

- Exterior
- Front panel/user interface
- Ventilator interior
- Electronic parts

Complete Parts List

Table 9-1 lists the complete list of all BiPAP Focus repair parts.

BiPAP Focus Service Parts		
Description	**Quantity**	**Part number**
Assy, User Interface PCA	1	1025750
Controller PCB Assembly (FRU)	1	1035076
Cover, Main Bottom Access	1	1025765
Cover, Main Top Access	1	1025771
Cover, Main Side Access	2	1025770
Cover, Screen Front	1	1025768
Cover, Screen Rear	1	1025769
Cover, Screen End Cap	1	1025767
Door, Main Rear Access	1	1025766
Cover, Battery Access	1	1025761
AC/DC Power Supply 120w, 18v	1	1025775
Panel, Int'l Membrane	1	1025773
Panel, US Membrane	1	1025774
Assy, Battery	1	1028006
Cable, Interconnect Comms	1	1025762
Harness, Battery Cable	1	1025776
Assy, Switch Control Cable	1	1031159
Cable, Interconnect Power	1	1025764
Cable, UI To VGA Parlex	1	1031239

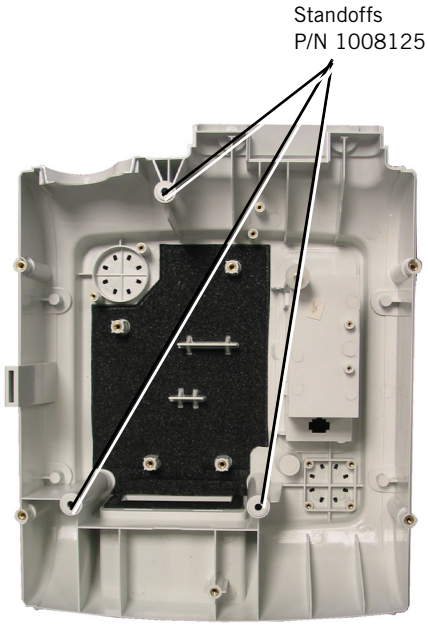
Table 9-1: Recommended BiPAP Focus Service Parts (Sheet 1 of 2)

BiPAP Focus Service Parts (Continued)		
Description	**Quantity**	**Part number**
Plate, UI Connector support	1	1031232
Foot, 19.81x5.08 A/Back Rubber	4	1031227
Clamp, 6.4mm Cable	1	1031162
Label, Main	1	1031229
Pack, Box/Foam	1	1031231
Cable,Screen To UI Gnd	1	1031161
Bezel, On/Off Switch	1	1031160
Alarm, Piezo (70dB) Unmodified (primary alarm)	1	1031158
Buzzer, Harmony II, NGBL (secondary alarm)	1	1013912
Screw, M2X6 Pozi Pan Head S/S	2	1031234
Strap, Harmony Valve Support.	1	1031236
Foam, Screen Gasket	1	1031225
LCD, 1/4 VGA	1	1008125
Board, 1/4 VGA Interface	1	1010858
Foam, Buzzer Filter (reusable air inlet filter - gray)	1	1031224
Filter, Pollen (disposable filter - white)	1	1005453
Clip, DC Power Conn S/Relief	1	1031223
Washer, 3.18 X 18.88 X 1.57 Nylon	1	1031240
Spacer, M3 X 8 X 5A/F Hex	1	1031235
Label, POWER ON/OFF	1	1031230
Screw, M3 X 10 Csk Pozi	2	1031233
Foam, S/Relief Clip Hole Inlay	1	1031226
Strip, S/Relief Clip hole Cover	1	1031238
Gasket, Plate Seal	1	1031228
Service, Screw, M4 X 10 Pozi Pan Head	9	1030145
Screw, M3 X 8 Pozi Pan Head	16	1030148
Service, Powercord, USA	1	1029989
Service, Powercord, UK/Ireland	1	1029982
Service, Powercord, Denmark	1	1029991
Service, Powercord, Europe	1	1029985
Clip, Low Profile S/Entry Cable	1	1030057
Screw, M3x20 Pan Head S/S	4	1030119
Service, Washer, #4 TYPE B NARROW FLAT	1	1030151
Service, Washer, M3 Split Lock	5	1030149
Kit, BiPAP Focus Communications Cable	1	1030010

Table 9-1: Recommended BiPAP Focus Service Parts (Sheet 2 of 2)

Exterior

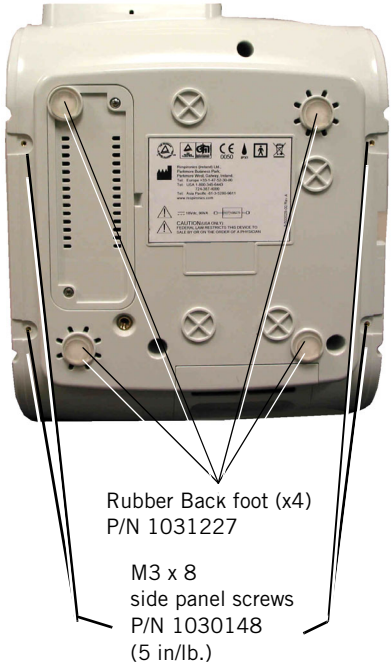
Top Enclosure
P/N 1025771



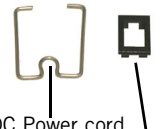
Bottom Enclosure
P/N 1025765

Side panel
P/N 1025770

VGA Side panel
P/N 1025767



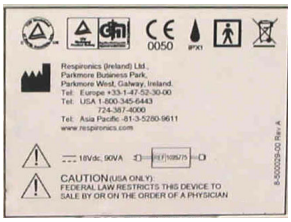
Exterior (continued)



DC Power cord relief clip
P/N 1030057

ON/OFF Switch Bezel
P/N 1031160

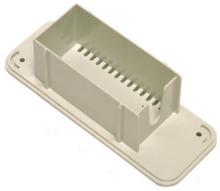
Main Rear Access Door
P/N 1025766



Main Label
P/N 1031229

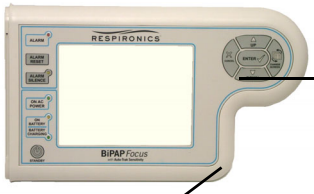
Reusable air inlet filter (gray)
P/N 1031224

Pollen filter (disposable filter - white)
P/N 1005453



battery access cover
P/N 1025761

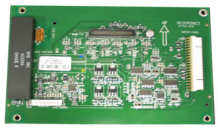
Front Panel/User Interface



Keypad assembly, English
P/N 1025774

Keypad assembly, Global
P/N 1025773

VGA front panel
P/N 1025768



VGA interface board
P/N 1010858

VGA LCD
P/N 1008125

VGA Rear panel
P/N 1010858

Ventilator Interior

snout (outlet port)
P/N 1000346

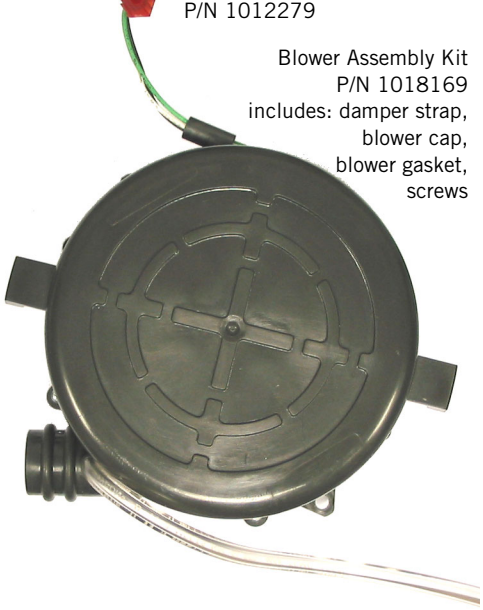
Air flow sensor
P/N 1008490

connector, silicone
P/N 1012002

diffuser
P/N 1018156

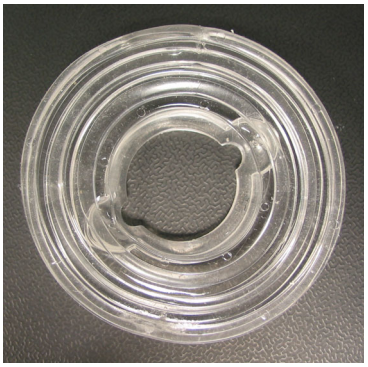
blower
P/N 1012279

Blower Assembly Kit
P/N 1018169
includes: damper strap,
blower cap,
blower gasket,
screws

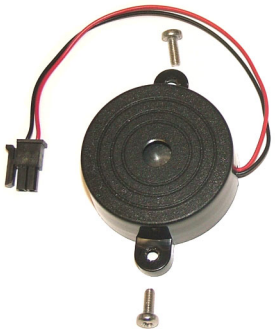


Valve
assembly
P/N 1017912

valve strap
P/N 1031236



blower gasket, silicone
P/N 1012279



secondary alarm
P/N 1031158

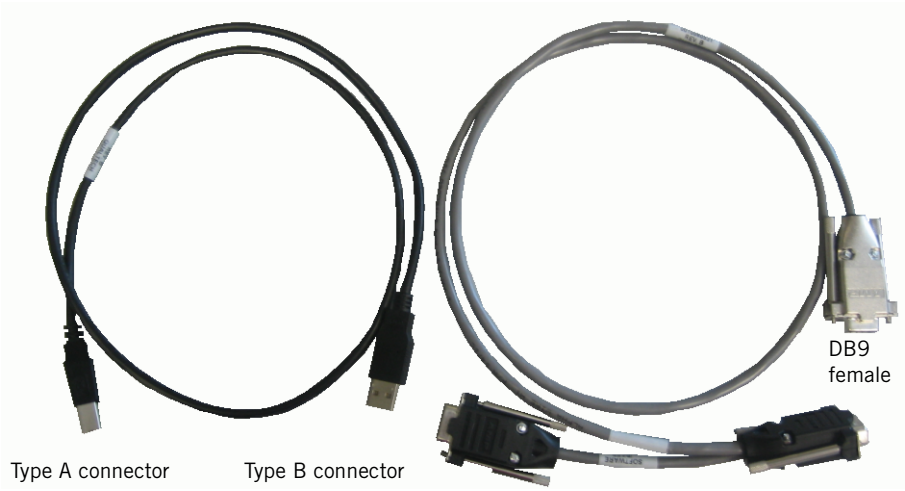
(3 in/lb.)

primary alarm
P/N 1013912

(2 in/lb.)

Communications Cables

BiPAP Focus Communications
Cable Kit
P/N 1030010



Type A connector

Type B connector

DB9 male
(modified)

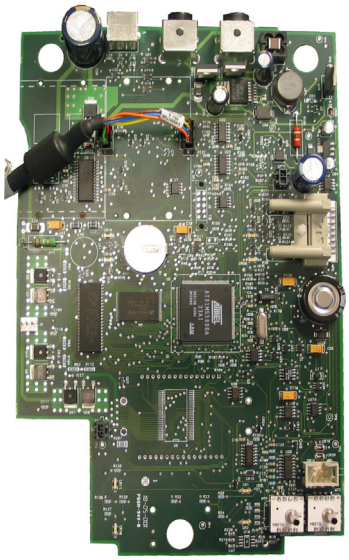
Software/RASP
connection

DB9 male
(modified)

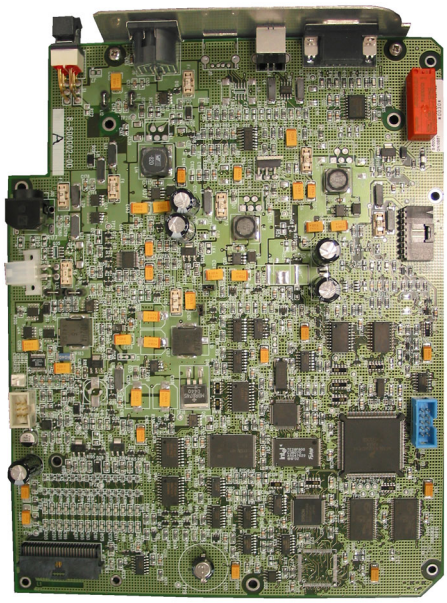
Diagnostics
connection

Electronic Parts

Controller PCB
P/N 1035076



User Interface Board
P/N 1025750

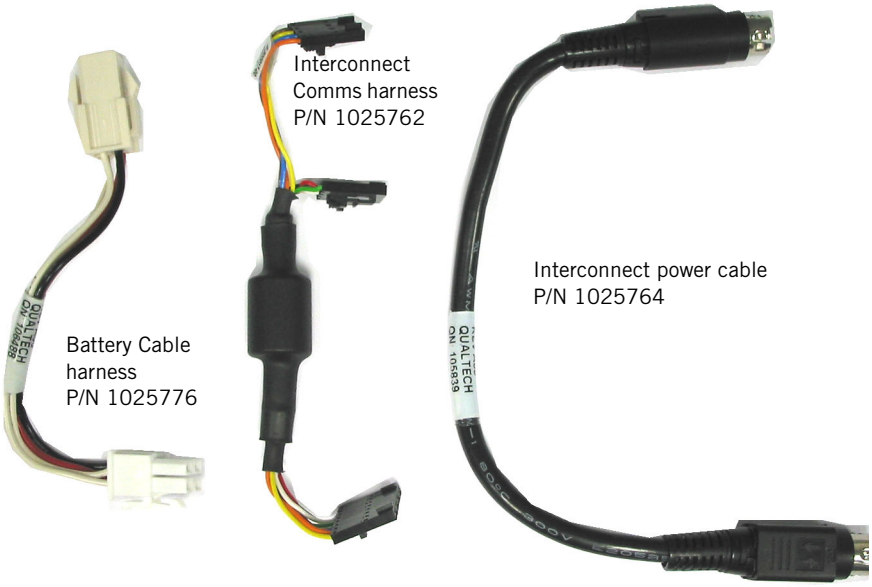


AC/DC power supply assembly
P/N 1025775

Battery
P/N 1028006

power cord
US P/N 1029989
UK/Ireland P/N 1029982
Denmark P/N 1029991
Europe P/N 1029985

BiPAP Focus Replacement Parts List



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